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NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

APPLICATION OF WARRANTIES IN THE
PROCUREMENT OF SPARE PARTS AT THE NAVY
FIELD CONTRACTING SYSTEM LEVEL

by

Richard M. Deschauer

June 1987

Thesis Advisor:

David V. Lamm

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Approved for public release; distribution is unlimited.

Application of Warranties in the Procurement of
Spare Parts at the Navy Field Contracting System Level

by

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June 1987

ABSTRACT

The objectives of this research were to identify and discuss the background of current warranty policy and its application to the acquisition of spare parts within the Navy Field Contracting System, specifically the Navy Aviation Supply Office and the Navy Ships Parts Control Center.

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I. INTRODUCTION

A. AREA OF RESEARCH

The United States Code requires that a warranty be included in all procurement contracts for major weapon systems. As further defined in the Department of Defense Federal Acquisition Regulation Supplement (DFARS), the Government will no longer act as self-insurer for the performance characteristics of the systems it buys and, as such, must implement the necessary administrative infrastructure to develop, apply and administer the process in a cost effective manner. While the DFARS language talks to the major systems, the implementation of widespread warranty coverage will have dramatic implications in the area of spare part procurements and how they will interact in the acquisition environment. This thesis concerns the principal problems regarding the application of warranty provisions to the acquisition of spare parts and how these problems might be resolved.

B. DISCUSSION

The use of the warranty provision in Department of Defense (DOD) acquisition has been sporadically applied since the early 1960's up to the passage of Title 10, Section 2403, of the United States Code (herein referred to as the Code). The passage of the law, and subsequent DOD

guidance has generated a great deal of concern within the individual services. Questions such as the following must be addressed: [Ref. 1: p. iii]

- How can complex military equipment be warranted?
- How much should a warranty cost (if anything)?
- What are the potential benefits?
- Can reasonable terms and conditions be developed?
- Can a military warranty be administered effectively?
- Will industry respond?
- Will the military user adapt?
- What tools are needed? What tools are available?

The Department of Defense and the individual services are addressing these types of questions in the development of policy directives, guidance handbooks and various instructions that run the gamut in the degree of specific procedural policy. However, the encompassing range of the warranty issue, the far-reaching administrative implications and the "no phase-in" approach to the legislation has left the military services with an overwhelming challenge.

Various efforts are currently underway to implement the warranty requirement in the Navy, specifically the Navy hardware system commands (HSC). However, the wholesale duplication of the efforts for spare parts procurements must be carefully examined. The nature of the life-cycle inventory and the consumer use of spares requires specific language in the use of express warranties. For example,

development of the necessary clauses used in the procurement will have to include essential performance requirements, duration, marking requirements, and repair and corrective action responsibilities and remedies.

As such, the Naval Supply Systems Command (NAVSUP) and the Navy Field Contracting System (NFCS) as a whole are faced with numerous choices regarding the application of the warranty towards the acquisition of spare parts. Recently released guidance from the Secretary of the Navy provides little guidance in narrowing the problems as defined to spares. It is hoped that a complete enumeration of the issues involved can lend towards a policy of effective warranty management at the spare parts level.

C. OBJECTIVES OF THE RESEARCH

The main objectives of this thesis are as follows:

1. Discuss the background of current warranty policy.
2. Investigate efforts underway in the Navy to implement the warranty requirement.
3. Investigate the warranty policy as it applies to the acquisition of spare parts.
4. Enumerate the major issues concerning the relationship of spare parts warranties and major systems warranties.
5. Investigate the spare parts warranty issue as it relates to the NAVSUP competition initiatives.

D. RESEARCH QUESTIONS

The primary research question is as follows:

What are the principal problems regarding the application of warranty provisions to the acquisition of spare parts and how might these problems be resolved?

Subsidiary research questions are as follows:

1. What are the current warranty requirements and provisions for spare parts procurements?
2. What problems have been and could be encountered in applying the use of warranties to spare part procurements?
3. Under what circumstances could the warranty requirement for spare parts procurement be waived?
4. What problems involved in the administration of warranties must be recognized in the development and use of warranty clauses?
5. What implication does the Navy Breakout Program have on the process of using warranties in spare parts procurement?
6. What specific steps can be taken to address the problems encountered by the Navy Field Contracting System in resolving warranty issues and problems?

E. RESEARCH METHODOLOGY

The basic research for this thesis was developed from a comprehensive study of current literature and from informal interviews with personnel directly involved with the warranty issue at the following commands and groups:

1. Selected members of the Navy Warranty Ad Hoc Group
2. Naval Supply System Command
3. Naval Air Systems Command
4. Naval Sea Systems Command

5. Office of the Assistant Secretary of the Navy (Shipbuilding and Logistics)
6. Ships Parts Control Center
7. Aviation Supply Office
8. Joint Cruise Missile Project Office
9. U.S. Air Force Product Performance Agreement Center.

Literature was obtained from the Naval Postgraduate School Library, Defense Technical Information Center, Defense Logistics Studies Information Exchange, Product Performance Agreement Center and the Defense Systems Management College. Additional regulations, directives, and instructions that concern the warranty process were obtained from applicable commands as referenced.

Appendix A provides a list of individuals who either were interviewed or provided information for this research effort.

F. SCOPE, LIMITATIONS AND ASSUMPTIONS

The general direction of the thesis is to provide a brief overview of the contractual issues of current warranty policy as it relates to the acquisition of spare parts. It deals with the U.S. Navy and is tailored to explore the ramifications on the Naval Supply Systems Command and the Navy Field Contracting System; specifically the Ships Parts Control Center and Aviation Supply Office. It will investigate the current general direction of the

development, application, and administration issues as they impact the spares acquisition process.

The warranting of major systems will be discussed for the purposes of investigating the relationship between weapon systems and spares. However, an in depth analysis will focus on the spares issues only. Administration of warranties will also be discussed but only to further enumerate the vastness of the issues involved. A detailed cost-effectiveness analysis of applying the performance warranty to spare parts is recognized to be an important research area but outside the scope of this thesis. No attempt was made to investigate the use of warranties in the shipbuilding or ship overhaul environment.

The relative newness of the performance warranty requirement has been a limiting factor in the research effort. Aside from the legislation itself and language contained in DFARS, there is little formal policy within the Navy regarding the institutionalization of the weapon system warranty and its relationship to the spare parts issue.

The warranty problem as it relates to NAVSUP, the Ships Parts Control Center, and Aviation Supply Office has been primarily relegated to the technical divisions. Contracting offices' concerns were largely limited to the legality of clause development and enforcement; and the hampering of the acquisition process due to new demands on the negotiating process.

This research makes the presumption that the enactment of the legislation and the subsequent DOD policy statement (as delineated in DFARS) is not at issue. It also assumes that the issues enumerated herein are taken in consequence of a completed cost-benefit analysis. Additionally, this study assumes that the reader has a general knowledge of Department of Defense contracting language and the Defense acquisition process.

G. DEFINITIONS

For the purposes of this study, the following key definitions are provided. Additional definitions are presented in Appendix B.

1. Warranty - used in a number of contexts. Its most restrictive meaning occurs in the traditional Government contract warranty clause (less frequently referred to as a Guaranty clause) which simply gives the government a remedy for patent defects discovered after acceptance. The reason for including such a clause is to overcome the finality of acceptance. Another meaning, the most common commercial use of the term, is that a warranty is a promise of the seller regarding the quality of the goods. In this sense the term is used to determine when a defect exists rather than to provide a remedy for the defect. [Ref. 2: p. 614]
2. Material and Workmanship - designed to provide an incentive for the contractor to consistently produce a weapon system that conforms to all manufacturing drawings and quality standards. The warranty is most important during the early periods of production. [Ref. 3: p. 9]
3. Design and Manufacturing Requirements - the structural and engineering plans and manufacturing particulars, including precise measurements, tolerances, materials and finished product tests for the weapon system being produced. [Ref. 4: p. 46.7-2]

4. Weapon System - a system or major subsystem used directly by the armed forces to carry out combat missions. By way of illustration, the term "weapon system" includes, but is not limited to the following, if intended for use in carrying out combat missions: tracked and wheeled combat vehicles; self-propelled, towed and fixed guns, howitzers and mortars; helicopters; naval vessels. . .[Ref. 4: p. 46.7-3]

A "weapon system," however, does not include the following: [Ref. 5: p. 2]

- a. Support equipment related to the items listed above, such as ground handling equipment, training devices and their accessories, or ammunition (unless an effective warranty for the weapon system would require inclusion of such items);
 - b. Commercial items sold in substantial quantities to the general public;
 - c. Any system that costs less than \$100,000 per unit or whose eventual total procurement cost is less than \$10,000,000;
 - d. Foreign Military Sales (FMS) contracts (the Government may, however, obtain warranties requested by an FMS purchaser if a mutually satisfactory price and arrangement can be negotiated).
5. Assurance Warranty - a warranty form consistent with 10 USC 2403 that is designed to assure that minimum required design, quality, and performance levels are achieved. There is no built-in incentive for the contractor to exceed minimum levels.
 6. Incentive Warranty - a warranty form that provides incentives for the contractor to exceed minimum design, quality, or performance levels.

H. ORGANIZATION OF THE STUDY

Chapter II presents basic background information on warranties; pertinent definitions and coverage of the specific types of warranties discussed throughout the thesis. Chapter III examines legislative and regulatory

policy and requirements related to the warranty concept in its application within the Department of Defense. Specific warranty application within the DoD acquisition process is discussed in Chapter IV. This will be an in depth review of the issues involved on a macro scale as they pertain to both major system buys as well as spares procurements. Chapter V will investigate the specific issues regarding warranty provisions of spare part procurements. Included are the ramifications on the competition initiatives underway at NAVSUP and the NFCS level. Presented will be case studies of efforts underway to deal with the spares' issues. Chapter VI develops findings, conclusions and recommendations.

II. BACKGROUND

A. INTRODUCTION

This chapter will provide a general overview of the nature of warranties and discuss the different types from a conceptual viewpoint. Implied and express warranties will be introduced along with a presentation of the three types of warranties required under the current legislation: essential performance; design and manufacturing; and, materials and workmanship. The chapter will conclude with a discussion of the general benefits of the warranty.

B. WARRANTY OVERVIEW

The use of warranties in commercial business transactions has become common place in the United States and throughout the world. Due to the competitive nature of the market, buyers receive warranty coverage regardless of personal choice. Manufacturers of expensive durable goods use the type of coverage they provide (i.e. duration, serviceability) as a method of product differentiation. [Ref. 6: p. 498-499] As such, consumers have come to expect some type of express warranty provision for almost all durable goods and view the implicit cost of such coverage as an integral part of the selling price. [Ref. 7: p. 1-4]

In the commercial sector, the early use of product warranties had primarily been viewed by manufacturers as a marketing tool. [Ref. 7: p. 1-4] However, the increased economic significance of the warranty concept has forced companies to refocus their perceptions. This is particularly true in light of the increased use of life-cycle costing techniques. The motivation for increased product reliability and serviceability is great when the manufacturer becomes the biggest customer for service of its own product. [Ref. 7: p. 1-4]

Generally, a warranty is a means by which a manufacturer assures the customer of the performance of the product delivered and a method of providing some basic servicing of the product for a given period after the product is in the hands of the consumer. [Ref. 7: p. 1-6] It tends to serve several functions, the most important of which from the buyer's standpoint is an insurance function or guarantee. [Ref. 8: p. 38] In so much that the manufacturer's product price includes a premium for the insurance (albeit implicitly), a prudent seller must establish clear cut reliability goals to obtain maximum cost-effectiveness.

In contrast to warranties, service contracts are optional protection purchased by the consumer and are significantly different than a warranty. The service contract is similar to a straight insurance policy, with the fee paid in advance by the consumer. Warranties involve

costs to the warrantor only if incurred, but the expected costs are reflected (to the extent that the market will bear them) in product prices. Service contracts are priced, that is to say the manufacturer (or the service offer) expects to recover costs and profit. Warranties tend to be regarded primarily as costs that must be recovered. This key difference points up the fact that the two instruments tend to generate differing incentives as to product reliability and serviceability. [Ref. 7: p. 1-7]

Within the confines of the Department of Defense (DoD) acquisitions, the normal market forces compelling contractors to offer guarantees and independently strive for maximum reliability do not exist. [Ref. 9: p. 5-61] Most procurements involve the two contractual parties in roles as monopsonist and monopolist. As such, DoD must employ the necessary stimuli to ensure some minimum reliability standard is met in the operational environment. This is accomplished through the use of a contractually binding warranty arrangement that forces the contractor to meet the standard or endure the added costs of unanticipated repairs and replacements. [Ref. 9: p. 5-61]

C. WARRANTY TYPES

To further understand the specific issues involved in warranty development and application, a discussion of the basic types of warranties must be presented. These are

generally considered to be implied warranties and express warranties.

1. Implied Warranty

An implied warranty has two main descriptions: (a) that the owner maintains title to the product and has the authority to sell it; (b) that the product meets the standards of that particular industry and is suitable for use. [Ref. 10: p. 17] This particular warranty type is common place in the commercial sector. Whereas express warranties come into existence by virtue of the bargaining of the parties, implied warranties come into being as a matter of law, without any bargaining, and as an integral part of the business transaction. They are always present unless clearly disclaimed or negated. Implied warranties exist even if a seller is unable to discover the defect involved or cure it if it could be ascertained. [Ref. 11: p. 438] It imposes a very broad responsibility on the seller to furnish goods which are at least of average acceptable quality for the purpose of which they are furnished.

2. Express Warranty

The Uniform Commercial Code does not define express warranties. Instead, it defines how they are created. An express warranty is created by (a) an affirmation of fact or promise made by the seller, (b) a description of the goods, or (c) a sample or model. [Ref. 12: p. 59] In each case, there is an express warranty that the product will

conform--if (a), (b), or (c) is part of the basis of the agreement. To create an express warranty, the seller does not have to use formal words such as "warrant" or "guarantee," nor must he have the specific intention to make a warranty. An express warranty comes into existence by virtue of any affirmation of fact or promise made by the seller to the buyer which relates to the product and becomes part of the bargain. These statements by the seller create an express warranty that the goods will conform to his affirmation or promise. A distinction is drawn between statements of fact and promises on the one hand, and statements of value or commendation on the other. As a general rule, a mere affirmation of the value of the goods or a statement purporting to be merely the opinion of the seller or his commendation of the goods does not give use to a warranty. The basic factor is whether the statement is fact or opinion.

D. ESSENTIAL PERFORMANCE WARRANTIES

Two basic essential performance warranty classification schemes have been developed to describe alternatives available to procurement activities. They are assurance and incentive warranties.

1. Assurance Warranties

The term "assurance warranty" is used when the primary intent is to assure that minimum design, quality and performance levels are achieved [Ref. 1: p. 3-1] The buyer

is not seeking anything more than the contract specifies, and the warranty concept and terms and conditions do not provide any incentives for the contractor to do otherwise. This is the basis of the performance warranty required by the Code. To establish a performance assurance warranty there are three critical steps: (a) establishing the performance level to be guaranteed, (b) establishing the necessary standards to effectively measure the performance, and (c) establishing the remedies for failure. [Ref. 12: p. 59] Within the scope of DoD acquisitions, these tasks are not easy and are exacerbated by the time frame of the legislation implementation date.

2. Incentive Warranties

The term "incentive warranty" is used for the type of warranty that provides incentives for the contractor to exceed minimum design, quality, or performance levels. For such a warranty, the contractor (or seller) can adapt a strategy to just meet the minimum performance levels. However, the warranty is structured so that the risks of failing to achieve the minimum levels, or the potential profit associated with exceeding those levels, will normally motivate the contractor to try to exceed those levels. This type of warranty may or may not meet the specified requirements of the Code. [Ref. 1: p. 3-2]

3. Assurance vs Incentive Warranties

The distinction between the two basic forms can be best illustrated by an example. [Ref. 1: p. 3-2]

. . . Assume that an equipment is to be procured that has a field Mean Time Between Failure (MTBF) requirement of 1,000 hours. For the selected warranty period, the warranted items are expected to operate for a total of 200,000 hours [assuming the warranty period is the same for both the assurance and incentive forms of warranty]. Therefore, if the MTBF requirement is met, the total number of failures expected to occur is $200,000/1,000 = 200$.

For an assurance type of warranty, the terms and conditions may state that all failures beyond 200 that occur during the warranty period must be repaired by the contractor at no additional cost to the Government. The contractor does not benefit from producing equipment with better than a 1,000-hour MTBF.

. . . Consider an incentive warranty form for the same example. Suppose the contractor is to provide depot repair services for this equipment over the warranty period at a fixed price, which is based on the required MTBF of 1,000 hours or 200 expected failures. The contractor, aware of this pending warranty commitment, realizes that each failure that can be eliminated results in more profit. The contractor therefore has the incentive to invest in design, production, and quality assurance to reduce the number of future failures. In addition, there is an incentive to search for the existence of pattern failures, and, if a "pattern"-type is observed early in the deployment phase, to develop a fix to reduce or eliminate such failures. This type of warranty is known as a reliability improvement warranty (RIW) because of the incentivizing features.

E. DESIGN AND MANUFACTURING WARRANTIES

In addition to the basic assurance and incentive forms of performance warranties, the Code also requires that DoD obtain a warranty in Design and Manufacturing requirements. These requirements are the "structural and engineering plans and manufacturing particulars, including precise

measurements, tolerances, materials and finished product tests." [Ref. 4] This type of warranty usually involves a one-time verification test. It may cover such features as size, weight, interfaces, power requirements, and material composition. If the finished product meets the requirements or specifications then the contractor has met his obligation.

F. MATERIALS AND WORKMANSHIP WARRANTIES

This type of warranty has long been used by the Government to control latent defects. A defect is a condition or characteristic that is not in compliance with the contract requirements. A latent defect is a defect that exists at the time of acceptance but does not manifest itself until sometime after acceptance. [Ref 1: p. 2-1] The purpose of the warranty clause is to remove uncertainties regarding latent defects by detailing the conditions under which a warranty claim can be made, irrespective of the condition of the product at time of acceptance. The clause allows for remedial action regardless of type of defect.

G. BENEFITS OF THE WARRANTY

Obtaining warranties for Government procurements is not without risk to both the Government and the contractor. However, a properly constructed warranty can fit the scheme of a "win-win" negotiated agreement. In the case of the incentive warranty form, the Government is "betting" that

the added cost of the warranty will provide the necessary incentive to the contractor to make up those costs in the design and production phases. The end result being that the essential performance requirements will be met for the specified time period. On the other hand, the contractor is betting that he will meet those requirements with fewer dollars and end up in a more profitable position. Quality and performance will thus achieve the win-win scenario.

Generally, the acquisition objective within the Department of Defense is to ensure that we field the best equipment possible at least cost to meet the goals of national defense. The warranty supports that objective by providing an incentive to the contractor to deliver high quality, reliable systems. Tangible benefits would include repair or replacement of defective parts to ensure long term reliability at minimal risk to the Government. The indirect benefits manifest themselves in the areas of reliability, maintainability, supportability and durability--the important "-ility" parameters of the acquisition strategy.

Specific advantages to use of warranty can be categorized as follows: [Ref. 3: p. 2-1]

- Extended contractor responsibility for field performance. The contractor is motivated to design and produce the item to meet the requirements at initial production release and to release and to operate as intended in the field.
- Expected performance, reliability and quality. If the contractor is committed to perform corrective action for warranty problems at his own expense, there is strong

motivation to meet or exceed the levels of performance on which the warranty price was determined.

- Assured lifecycle costs. When a contractor is motivated to reduce repair costs in order to minimize liability, a corresponding reduction of support costs may result.
- Early and rapid resolution of problems. With a warranty, problem areas receive high visibility and gain management attention [particularly in the current environment subsequent to passage of 10 USC 2403]. This generally results in quick action to solve the problems, providing additional protection to keep dependent areas on schedule.
- Incentive for no-cost engineering change proposals. The contractor may introduce no-cost engineering change proposals (ECPs) to correct problems in order to reduce repairs under the warranty.
- Realistic estimates of field performance. If the contractor is overly optimistic about expected field performance, warranty funds can be depleted rapidly and profits will be reduced. A warranty can be a tool for achieving greater realism in proposals. Engineering review can be instrumental in assuring such discrepancies do not exist.
- Improved evaluation of field performance. Early contractor involvement in the evaluation of field failures may lead to early development of corrective action programs.
- Operation and support planning based on actual data. Where contractor support is part of the warranty, actual usage data provided to the Government may permit improved accuracy in acquiring logistics resources during the transition to maintenance and support that will be performed by the Government. Support and test equipment, repair procedures, engineering and provisioning data will be thoroughly validated and verified before it is delivered to the Government.

Not all benefits will be realized on each warranted acquisition. In fact, unless the warranty is fully developed into the acquisition plan, expected benefits can quickly become serious drawbacks. For example, the contractor-support concept must address the organic

maintenance issue early on. Transshipment of failed components cost time and money and reduce the operational availability of the unit. If and when the transition is made to organic maintenance, will the expertise be available? To what degree will reliability suffer during the learning process? The implicit benefits of the warranty are not automatic and require a conscientious approach.

H. CHAPTER SUMMARY

This chapter has presented an overview on the basics of the warranty concept. This broad framework is necessary to understand the background of the warranty legislation that will be presented in the next chapter. It is also a requirement to understand the pertinent issues involved in the development and application issues discussed in subsequent chapters. At first glance, the benefits of the warranty would seem substantial and far outweigh the problems of implementation and administration. However, an understanding of the potential benefits will serve to become a basis for understanding the issues and problems facing the Navy Field Contracting System in implementing the warranty requirement as related to the acquisition of spares.

III. WARRANTY LAW AND DEPARTMENT OF DEFENSE POLICY

A. INTRODUCTION

Congressional interest in warranties as a means of ensuring field performance started with the passage of the Defense Appropriations Act of 1984. The law, with modifications, was made permanent by inclusion of the 1985 Warranty Law in the 1985 Defense Authorization Act. This legislation has had a profound impact on the Defense acquisition and logistic processes and remains a controversial topic with regard to implementation. This chapter will present the background of this legislation and discuss the subsequent Department of Defense (DoD) and Navy policy directives.

B. HISTORY OF WARRANTY USE IN THE DEPARTMENT OF DEFENSE

In 1965, Ralph Nader authored a best-selling book entitled Unsafe At Any Speed: The Designed-in Dangers of the American Automobile, "chronicling glaring deficiencies in the design and production of a sequence of American compact cars, the Chevrolet Corvair." [Ref. 13: p. 45] This book appeared to have reversed the general notion of "Caveat Emptor" ("buyer beware") and introduced the concept that corporations have a moral and legal responsibility to

produce a product which meets the explicit and implicit expectations of the consumer market. [Ref. 13: p. 45]

Warranties were introduced in earnest into the Defense Department in the late 1960's as a fallout from their commercial use in the avionics and airframe industry. [Ref. 14: p. 335] The widespread use of warranties began to increase in Defense procurements as they were applied to more complex system buys and also because many commercial items purchased by the various logistic agencies came with some type of warranty provision. Based on a 1979 internal Department of Defense study, one-third of the 4.1 million types of items in DoD's inventory were covered by some type of warranty. [Ref. 10: p. 28]

Specific application began with the development and use of the Reliability Improvement Warranty (RIW). This type of warranty involves a fixed price commitment that obligates the contractor to repair or replace, within a specified period of time, all warranted equipment that fails during the coverage. [Ref. 8: p. 11] Ideally, this provides the necessary motivation for the contractor to increase reliability, in the design and production phases, in order to decrease his repair warranty costs and maximize his profits. It is the most common form of the incentive warranty discussed in Chapter II. In a pure Reliability Improvement Warranty contract, the contractor is not

obligated to provide equipment that demonstrates a specified Mean Time Between Failure (MTBF). Instead, the price of the warranty is calculated using an "expected" Mean Time Between Failure. If the field failure rate rises above the set level, the contractor begins to lose potential profit as the increased number of failures increase his repair costs. A decrease in the realized failure rate will, in the same manner, decrease his repair costs and increase his profit position. The contractor is therefore motivated to increase the Mean Time Between Failure of the equipment as much as possible, if the realized savings from decreased repair costs are greater than the cost of improving product reliability.

After evaluating the Department of Defense use of the Reliability Improvement Warranty and other efforts used during the 1970's, researchers concluded that a properly structured and implemented warranty program could offer significant potential for achieving desired operational performance at reasonable cost. [Ref. 15] This conclusion, centering on expected cost savings, provided a basis for extending warranty applications to a broader class of programs. By the beginning of the 1980's, the use of warranties in the acquisition of military hardware systems became a "standard" option, but it was only selectively applied and

usually required a special effort on the part of the program office to develop and implement. [Ref. 1: p. 2-2]

In 1978, acquisition initiatives developed by the Air Force Systems Command included expansion of the use of warranties in weapons procurement, particularly the Air-Launched Cruise Missile (ALCM), Advanced Medium Range Air-to-Air Missile (AMRAAM), and various jet engine procurements. [Ref. 13: p. 60] Additionally, the Air Force Product Performance Agreement Guide (PPAG) was developed with the assistance of industry, providing annotated examples of warranties with descriptions, a discussion of applicability, measurement of compliance, and advantages and disadvantages in any particular procurement for a number of warranty provisions. [Ref. 16: p. A-2]

In December of 1980, the Air Force established the Product Performance Agreement Center in Dayton, Ohio, with the goal of serving as a DOD-Industry clearinghouse for product performance data and analysis. [Ref. 16: p. A-2] Tasking included updating the Product Performance Agreement Guide, risk/cost benefit modeling, and general administrative support in warranty endeavors. [Ref. 16: p. A-2]

The Army also began warranty initiatives in 1981. A directive was issued to establish the policies and procedures for administration of the Army's newly established warranty program. [Ref. 13: p. 61] However, a study

published by the Army Material Systems Analysis Activity Logistics Studies Office concluded that the regulation was neither well known nor universally applied. The efforts of some commands yielded effective results and others did not. [Ref. 13: p. 61] The study concluded with the following paragraph that summed up the general Army warranty policy of the early 1980's: [Ref. 13: p. 62]

. . . Finally, remember that it is Army policy that warranties will not be acquired under normal circumstances. A warranty will be sought if it cannot be equitably removed from a commercial item, or if it will provide a definite benefit to the Army; the decision to acquire a warranty will be made only if the decision maker is convinced absolutely that one of the aforementioned conditions prevail.

While the Army policy was clearly stated regarding the warranty issue, this position of warranty-avoidance was not unique. Interviews have indicated that as the ramifications of warranty administration became clear, many agencies throughout DoD, closer to the end-user of the warranted item, felt that the costs exceeded any derived benefits in every case. Coupled with the inherent policy of the Government as "self-insurer", this attitude impeded any full scale development of the warranty throughout the Defense Department in the early 1980's.

During this timeframe, there was an effort by the Defense Acquisition Regulatory (DAR) Council to improve the Defense Acquisition Regulation guidance in warranty application and administration. [Ref. 13: p. 62] The changes

proposed were considered reactive to the general feeling among DoD field contracting activities that warranty guidance was greatly inadequate in terms of administration. Proposed new language discussed included: [Ref. 17: p. A-25]

- When to employ a warranty
- The use of billback terms (reimbursement by the contractor for a covered claim repaired by the Government or a third party)
- Command designated warranty control personnel with the primary responsibility for administering warranties and warranty claims.

C. CURRENT WARRANTY LAW

1. Overview

Senator Mark Andrews of North Dakota offered the initial warranty provision from the floor as an amendment to the fiscal year 1984 Department of Defense Appropriation Act. His argument for the proposed legislation centered on requiring defense contractors to warrant products the Government purchases, just as John Deere warranted a tractor Andrews had purchased from that company. [Ref. 13: p. 63]

Senator Andrews had drafted the proposal as early as mid-July in 1983 and had provided it to various industry groups for review. [Ref. 13: p. 63] The following comments regarding the proposal are taken from an internal memorandum of a major aerospace prime contractor and are not atypical of the defense industry: [Ref. 13: p. 63]

As a generalization, the proposed amendment is so hopelessly out of phase with economic reality, good contracting practice and common sense that it is impossible even to begin to suggest changes that might make the amendment more administrable.

[Notable deficiencies included:]

- the application of performance warranties to low volume productions of low maturity items
- the fact that the law would require modification of numerous existing contracts
- that placing a requirement on cost type contracts for the contractor to bear all the costs of repair or replacement effectively eliminates such contracts
- that "performance requirements" frequently change over the life of the weapon system
- that contractors would be unwilling to warrant a design over which it had no control.

While lengthy discussions ensued between the Senator and selected industry representatives, no substantial changes were made to the proposal. Senator Andrews believed that this legislation and other legislative initiatives would force DoD to change acquisition behaviors and "begin to act more like commercial buyers." [Ref. 13: p. 65]

Industry as a whole, however, put up little struggle to fight the warranty issue. The timing just was not right. After repeated blows from the press concerning spare part pricing abuses, defense contractors were not willing to be publicly accused of hindering Congressional acquisition reforms. [Ref. 13:64]

The Department of Defense also testified periodically over the issue, but was hampered by an additional problem. At the time, there were well over one hundred pieces of acquisition-related legislation being introduced. Without hard-core evidence to bolster their defense against the warranty issue, DoD deferred and set off in search of "bigger windmills". [Ref. 13: p. 65]

2. Current Warranty Law

With the signing of the 1984 Appropriations Act, written warranties (the statutory language uses the word guarantee and warranty interchangeably) became a requirement in contracts for major weapon systems. Section 794 of the Act states: [Ref. 18: p. 154]

No funds. . . may be obligated or expended for the procurement of a weapon system unless the prime contractor or other contractors for such a system provide the United States with written guarantees.

On 16 December 1983, Deputy Secretary of Defense Paul Thayer issued a 90-day blanket waiver of the legislative requirements to allow DoD sufficient time to clarify policy and administrative issues. To forestall any Congressional backlash for the waiver, DoD delineated their immediate concerns to Senator Andrews in a memorandum. [Ref. 19] These included:

- potential requirement for pedigreed parts
- impact on component breakout
- impact on small business

- structure of the flowdown procedures
- potential to impact field maintenance capabilities
- potential for delays to contracts currently being negotiated
- potential inhibition of technological innovation
- difficulty in determining credible reliability data

On 20 January 1984, DoD issued its draft implementation guidance in the Federal Register. The feedback was overwhelming. Almost 200 point papers were received from numerous contractors, small businesses, and special interest groups. [Ref. 13: p. 70] While some positive comments were submitted, most inputs dealt with the restrictive language of the law and its resultant impact on direct and administrative costs.

Franz O. Ohlson, vice president and director of the Aerospace Industries Association's Procurement and Finance Council wrote: [Ref. 20: p. 25]

Simply stated, we believe that section 794 [warranty requirement] is unworkable, cost ineffective and unnecessary in view of existing warranty provisions. Section 794 is an attempt to apply commercial warranty practices to government procurement of weapon systems. While well intentioned, this effort fails fully to take into account the special circumstances and restrictions inherent in military production.

William E. Hardman, president of National Tooling and Machining Association, stated: [Ref. 20, p.25]

. . . it would be unfair to require a subcontractor to provide performance guarantees, and it would force small and medium-sized firms to stop doing business with the Defense Department.

As the joint DoD-Industry campaign for repeal of the law began to mount, Congressional support for some type of relief became apparent. Senators Sam Nunn (D-GA) and Carl Levin (D-MI) also said they were concerned about the impact of the law on small businesses without sufficient reserve capital to fund the warranty penalties. Additionally, Senator John Tower (R-TX) expressed his concerns: [Ref. 20: p. 25]

. . . there seems to me to be a great problem if we suddenly demand that defense contractors who have not designed a particular system stand as insurers that the Government's design will work. There is an important difference between a workmanship warranty, which insures the Government that a system is properly built to whatever design has been agreed upon, and a performance guarantee, which deals with whether or not the particular design will achieve its goals.

Some key lawmakers were having reservations about the warranty law, realizing that the issue is indeed more complicated than it may have seemed when Senator Andrews introduced his amendment. However, 1984 was an election year and Congress would find it tough to vote for repeal of a law that was clamping down on the wasteful ways of Defense acquisition. Additionally, the Defense Department was equally aware that "pushing too far" might alienate some Republican Congressmen that were to play a key role in achieving the President's 1985 defense budget [Ref.21: p. 143] As such, DoD accepted revision vice repeal with some resignation.

A compromise effort was published on 31 May 1984 as Section 191 of the Defense Authorization Bill. In addition to defining those terms key to the statutory language (as delineated in Chapter I, Section G), the new legislation addressed the problem regarding small businesses. Exempting all but the prime contractor, the legislation called for the traditional system whereby the prime assumes responsibility for the complete integrated system and obtains warranties from subcontractors as appropriate.

The risk to the contractor for warranting initial production items was minimized by requiring a written guarantee for essential performance only during mature full-scale production.

An additional key revision, one of the more significant to DoD, relaxed the legislative requirement to report any warranty waivers directly to Congress. The original language of Section 794 was so stringent that any waiver developed below the Secretary of Defense level was virtually impossible to submit for eventual approval. [Ref: 13: p. 80] The new language allowed for both class and individual waivers.

Perhaps one of the most important revisions found in the legislative history involves the "cost-effectiveness" waiver. No longer regarded as an "extraordinary mechanism", a waiver request due to "unreasonable costs" is now

considered "a potential natural result of conscientious negotiations between DoD and the contractor."
[Ref. 22: p. 246-247]

The revisions to the 1984 Defense Appropriations Act did not address every issue of the warranty requirement. Numerous concerns of both DoD and Industry regarding implementation and administration remained. However, the compromise for the revisions realized was the extent of Congressional leeway on the issue. The modified law was made permanent by inclusion of the 1985 Warranty Law in the 1985 Defense Authorization Act. Formally codified, the Defense Procurement Reform Act (Public Law 98-525), effective January 1985, established Title 10, Section 2403 of the United States Code, entitled "Major Weapon Systems: Contractor Guarantees" (included as Appendix C).

D. FEDERAL ACQUISITION REGULATION WARRANTY POLICY

The requirements of the Warranty Law are specific to the Department of Defense. Section (h)(2) to the statute states that "[the law] does not apply to the Coast Guard or to the National Aeronautics and Space Administration." [Ref. 23] As such, there has been no specific revision to the Federal Acquisition Regulation (FAR) pertaining to the criteria for use of warranties. Specific legislative requirements have been incorporated directly into the Defense Federal Acquisition Regulation Supplement (DFARS).

The use of warranties in general Government acquisition is straight-forward and recommended only when clearly in the Government's best interests. The criteria established for use of the warranty is as follows: [Ref. 23: p. 46.703]

The use of warranties is not mandatory [researcher's emphasis]. In determining whether a warranty is appropriate for a specific acquisition, the contracting officer shall consider the following factors:

1. Nature and use of the supplies and services. This includes such factors as:
 - a. Complexity and function;
 - b. Degree of development;
 - c. State of the art;
 - d. End use;
 - e. Difficulty in detecting defects before acceptance; and
 - f. Potential harm to the Government if the item is defective.
2. Cost. Warranty costs arise from:
 - a. The contractor's charge for accepting the deferred liability created by the warranty; and
 - b. Government administration and enforcement of the warranty.
3. Administration and enforcement. The Government's ability to enforce the warranty is essential to the effectiveness of warranty. There must be some assurance that an adequate administrative system for reporting defects exists or can be established. The adequacy of a reporting system may depend upon such factors as the:
 - a. Nature and complexity of the item;
 - b. Location and proposed use of the item;

- c. Storage time for the item;
 - d. Distance of the using activity from the source of the item;
 - e. Difficulty in establishing existence of defects; and
 - f. Difficulty in tracing responsibility for defects.
4. Trade practice. In many instances an item is customarily warranted in the trade, and, as a result of that practice, the cost of an item to the Government will be the same whether or not a warranty is included. In those instances, it would be in the Government's interest to include such a warranty.
5. Reduced requirements. The contractor's charge for assumption of added liability may be partially or completely offset by reducing the Government's contract quality assurance requirements where the warranty provides adequate assurance of a satisfactory product.

Warranty guidance provided in the FAR allowed DoD program managers to pursue warranties when it was self-evident that benefits would accrue. Warranties were not mandatory prior to the current legislation nor are they mandatory for current procurements specifically exempted in the statute. One of the major impacts of the law was that for the first time it required DoD to perform cost-benefit analysis to demonstrate that the use of a contractually-binding warranty is not cost-effective. Previously, analysis was used to support the added cost of a warranty provision. [Ref. 24]

E. DEFENSE FEDERAL ACQUISITION REGULATION SUPPLEMENT POLICY

In conjunction with the passage of the code, DoD issued a guidance document in the form of a revised Defense Federal Acquisition Regulation Supplement (DFARS). "Use of Warranties in Weapon System Procurements" specifically addresses the warranty legislation and provides guidance and direction in such areas as tailoring clauses, Government-furnished property, foreign military sales, warranty cost-benefit analysis, and waiver procedures (included as Appendix D).

In contrast to the FAR, DFARS criteria for warranty use is in direct consonance with the new legislation. Specifically: [Ref. 4: p. 46.703]

The use of warranties in the procurement of weapons systems is mandatory pursuant to 10 USC 2403, unless a waiver is authorized. Policy and procedures for obtaining such warranties or waivers are contained in [DFARS] 46.770. Acquisition of warranties in the procurement of supplies that do not meet the definition of a weapon system (e.g., spare, repair, or replacement parts) is governed by FAR 46.7. However, should the Government elect to obtain a warranty for such supplies, contracting officers should negotiate warranties that meet or exceed the requirements of [subpart] 46.770 where such warranties are advantageous and in accordance with Departmental policy.

DFARS further specified three areas in which a prime contractor must provide the Government with a written warranty. These include: [Ref. 4: p. 46.7702]

1. Design and manufacturing requirements specifically delineated in the contract (or any modification to that contract).

2. Free from all defects in material and workmanship at the time of acceptance or delivery as specified in the contract.
3. If manufactured in mature full-scale production, conform to the essential performance requirements as delineated in the contract (or any modification to that contract).

Aside from the flowdown of requirements from the statutory language, the DFARS emphasized the tailoring of warranty terms and conditions appropriate to the specific acquisition. This "latitude" is an extremely important consideration in the subsequent discussion of formulation of Navy policy. Warranties, as in the case of any risk transfer mechanism, must be applied on a case-by-case basis and accomplished through the negotiation process. Specific policy states: [Ref. 4: p. 46.770-3]

. . . Contracting officers may exclude from the terms of the warranty certain defects for specified supplies (exclusions) and may limit the contractor's liability under the terms of the warranty (limitations), as appropriate, if necessary to derive a cost-effective warranty in light of the technical risk, contractor financial risk, or other program uncertainties. Contracting officers are encouraged to structure broader and more comprehensive warranties where such are advantageous and in accordance with agency policy. Likewise, the contracting officer may narrow the scope of a warranty where such is appropriate (e.g., where it would be inequitable to require a warranty of all essential performance requirements because a contractor had not designed the system).

Of additional note, for purposes of this research, is the treatment of warranties on Government-furnished equipment (GFE). The original legislation contained in the 1984 Defense Appropriations Act did not exempt the requirement

for prime contractors to include GFE in the overall integrated system warranty. Clearly, such a practice would shift the financial risk to the contractor in such a proportion as to make all but a select few warranty arrangements cost prohibitive. DFARS states: [Ref. 4: p. 46.770-5]

A prime contractor shall not be required to provide the warranties specified in [DFARS] on any property furnished to that contractor by the United States except for (a) defects in installation, (b) installation or modification in such a manner that invalidates a warranty provided by the manufacturer of the property, or (c) modifications made to the property by the prime contractor.

F. NAVY WARRANTY POLICY

Within the Navy, specific efforts to address current warranty issues have been sporadic and untimely given the January 1985 implementation mandate of the current code. In September 1985, the Assistant Secretary of the Navy (Shipbuilding and Logistics) established the Navy Warranty Ad Hoc Group from representatives of the Navy Systems Commands. This group was assigned to accomplish the following : [Ref. 25]

1. Establish essential performance requirements criteria;
2. Establish procedures for warranty field administration; and
3. Determine contractual requirements to be placed on contractors (i.e., segregation of historical warranty cost data).

In late November 1985, the first draft of the proposed Secretary of Navy Instruction, "Navy Policy on Use of

Warranties," was submitted to the major Navy field activities for review. [Ref. 26] Initially, the treatment of express warranty cost and the associated contractor risk were the prime stumbling blocks in publishing written policy. [Ref. 10: p. 44] As of 1 July 1986, the major sub-parts of the requirements section of the instruction were as follows [Ref. 10: p. 45]

1. Navy Warranty Cost-Benefit Analysis Policy Guide;
2. Definition of essential performance requirements;
3. Minimum marking requirements; and
4. Broad-sweeping administrative guidelines.

The final instruction has yet to be issued, thirty months subsequent to the January 1985 implementation date of the warranty legislation. To the extreme surprise of many of the interviewees who worked on the draft instruction, the proposed final release is a scant two-page document. The scope of the action requirements is provided as necessary background for subsequent discussion:

a. The Chief of Naval Operations will:

- (1) establish procedures to ensure that warranties are obtained for:
 - (a) weapons systems meeting the thresholds specified here [criteria outlined in DFARS 46.770-2, Appendix C].
 - (b) all other supplies and services (i.e., non-weapons systems) per . . . [FAR and DFARS].
- (2) establish procedures to ensure maximum use of warranted products before expiration of the warranty periods.

- (3) establish a customer/user notification system which provides for feedback information on failed items under warranty, minimizing reporting requirements of fleet activities and maintenance personnel.
 - (4) develop procedures for immediate issuance of credit to the end item user, when appropriate, when requisitioned products under warranty are found to be defective upon installation.
 - (5) develop a system for collecting actual warranty use and claim data, and for performing an analysis of the data on an annual basis with the first analysis to be performed on 30 June following implementation of this instruction, and annually each June thereafter. Provide copies of annual warranty data analyses to the Assistant Secretary of the Navy (Shipbuilding & Logistics) (ASN(S&L)) within 60 days of the end of each annual analysis period.
- b. The Comptroller of the Navy will ensure that procedures are available to collect funds under warranties and that those funds are properly credited to the appropriate accounts.
 - c. The Commandant of the Marine Corps will develop policies and procedures for processing warranty claims.

The proposed instruction does little to answer the concerns that were raised by the Navy Warranty Ad Hoc Group. For example, policy decisions regarding the scope, limitations, and applicability of cost-benefit analysis to the individual warranty efforts have yet to be made. Key players in a consentaneous approach to implementation and development must be decided upon to facilitate the collection and use of meaningful warranty feedback. Significant cost-benefit analysis mandates access to a central database of this nature. Also the effect on the

Navy's competition initiatives must be addressed to ensure compliance with the "DoD Replenishment Parts Breakout Program" Statute.

Additional Navy policy will be implemented through a proposed change to the Navy Acquisition Regulations Supplement (NARSUP). Warranty administration, per se, is addressed in the draft and specifies the minimum contract data that must be collected: [Ref. 27: p. 42.302 (a)(90)(c)]

1. Item description;
2. Applicable contract number;
3. Contractor name and location;
4. Dollar value of item under warranty;
5. Scope of the warranty (i.e., what is warranted, what is not) and identification of the warranty provisions (clause numbers) in the contract;
6. Warranty item repair history, including nature of repairs, cost and frequency; and
7. Government costs changeable to the contractor (e.g., repair, rework, modification, procurement and transportation costs).

The collection effort necessary to support this requirement will be an enormous undertaking. It will entail the integration of data from the program office; contract administration activity; inventory control point; depot, intermediate, and organic maintenance activities; and the fleet user. The current legislation requires the guarantee of essential performance requirements and conformance with design and manufacturing requirements only when a system is

in mature, full-scale production. Full-scale production is defined as the manufacture of all units of a weapon system or other defense equipment after the manufacture of either the first ten percent of the eventual total production or the initial production quantity, whichever is less. The materials and workmanship warranty, however, is still required on all units, regardless of coverage by the essential performance guarantee. The consequences of this being that equipment will be in the fleet with differing warranty coverage. This further complicates the data collection effort and substantially increases the chances for the compilation of erroneous data.

Additional policy to be promulgated in the NARSUP change definitizes the marking requirements for warranted items. As a minimum they must include: [Ref. 27: p. 46.706(b)(5)]

1. National Stock Number (NSN) or manufacture's part number;
2. Serial number or other item identifier;
3. Contract number;
4. Some indication that a warranty applies;
5. Manufacturer or entity providing the warranty;
6. Date or [operational] time that the warranty expires;
and
7. An indication whether or not attempted on-site repair by Navy personnel will void the warranty.

Of further note is the inclusion of the Air Force Product Performance Agreement Center in the NARSUP change.

Program managers and contracting officers are encouraged to contact the [center] for assistance in developing and analyzing potential warranty clauses and cost-benefit analysis modes [researcher's emphasis]. [Ref. 27: p. 46.90]

Further discussion of the Product Performance Agreement Center and its role in the warranty process will be provided in subsequent chapters.

G. CHAPTER SUMMARY

As necessary backdrop for further warranty discussion, this chapter presented a brief overview of use of the warranty in the Defense Department. Prior to the current legislation, warranties were in use in DoD, albeit sporadically applied. The warranty law, 10 USC 2403, levied the requirement that all major weapon system acquisitions will include a written guarantee which covers essential performance requirements in addition to the traditional materials and workmanship warranty. This has had a profound impact on the acquisition and logistics processes in DoD which are still being formalized. Proposed Navy policy addresses the tasks ahead, necessary for compliance, but has not addressed the key issues in development, implementation and administration of the warranty as it applies to the interaction of the hardware systems commands and the Navy Field Contracting System.

IV. WARRANTIES AND THE ACQUISITION PROCESS

A. INTRODUCTION

This chapter will focus on the warranty and its implication in the development of the acquisition strategy. While a warranty becomes effective after equipment acceptance by the Government, the process of developing the specific warranty agreement must start early in the requirements phase. [Ref. 28, p. iii] This development process will be discussed as background to an examination of the spares issues. The issues involved in developing the specific warranty form will be examined as well as the application of cost-benefit analyses and the waiver process. Also, the role of the Air Force Product Performance Agreement Center (PPAC) and its potential impact in the warranty process will be discussed. The chapter will conclude with a broad overview of warranty administration and its implications for the Navy Field Contracting System, specifically the Navy Ships Parts Control Center (SPCC) and the Navy Aviation Supply Office (ASO).

B. OVERVIEW OF WARRANTY DEVELOPMENT

1. Strategy Development

Navy acquisition planning must include all phases and related activities from product inception to operational

support. [Ref. 29: pp. 3-15] Problems incurred during the life-cycle of a program are inversely proportional to the amount of planning incurred early on. A well developed acquisition strategy is a vehicle to introduce the necessary flexibility into a program and ensure that selected goals of performance, cost and risk allocation are met. [Ref. 24] Every acquisition is unique in the sense that specific objectives vary. While maximum performance for minimum cost are usually the mainstays of general objectives, the strategy to achieve these objectives must be tailored to fit the need. Considerations for unique strategy development include: [Ref. 29: p. 4-2]

a. Management Concepts

- (1) Use of organizational assets
- (2) Planning and control of critical program activities
- (3) Establishing the baseline for the Integrated Logistics Support Plan (ILSP) and the Test and Evaluation Master Plan (TEMP)
- (4) Identification of known-unknowns and their likely impact
- (5) Scheduling
- (6) Testing, demonstration and evaluation

b. Interdependence of effort with other programs

- (1) Platforms on which the developing system is to be used
- (2) Other programs on which the program depends for technology demonstrations, fallback options, interface requirements, or components

- (3) Interservice or North Atlantic Treaty Organization (NATO) interoperability requirements

c. Competition concerns

- (1) Methods for obtaining and maintaining competition
- (2) Into what phases should competition extend and at what level (system, subsystem, component)?
- (3) Will there be competitive procurement? Reprocurement?
- (4) How many and what kind of competitors?
- (5) Cost-benefit analysis
- (6) How and when to transfer laboratory contributions/Government-owned information to competitors
- (7) Selection criteria for choosing best alternatives
- (8) Funds available, timing

d. Contracting considerations

- (1) Type of contract for each phase and rationale for its selection
- (2) Contracting plan
- (3) Preparation of solicitation of proposals
- (4) Makeup of source selection and proposal evaluation teams
- (5) Evaluation of proposals, criteria
- (6) Use and handling of proprietary materials; how to obtain Government rights to them; how essential is Government control of the proprietary material?
- (7) Contracting initiatives, use of contract incentives
- (8) Monitoring contracts and contract controls

e. Design-to-cost and life-cycle costs (LCC)

- (1) Methods for projecting LCC
- (2) Goals for design-to-cost, when, how rigid
- (3) Manpower, resources, logistics, energy
- (4) When to start and fund product improvement programs

f. Budgeting considerations

- (1) Realistic funding requirements (by phase) to achieve objectives, including land-based test support, test and evaluation, ILS
- (2) Estimates of cost associated with cost growth during research and development
- (3) Effect of decreased budget allocations on production rate, unit cost, program "stretch-out", minimal and optimal amounts required yearly for each phase.

These considerations are typical of the issues that must be addressed in tailoring an acquisition strategy. Specific plans associated with these issues support the selected strategy and must be updated as changes occur throughout the cycle.

2. Risk Assignment

Inherent to all aspects of strategy formulation is the concept of risk. The estimation of risk and its effective management are essential elements to a successful program. Risk management is defined as "the process of identifying areas of risk that can effect the successful development of a system, and taking corrective action to reduce the risk to an acceptable level." [Ref. 29: p. 4-44]

The methodologies involved are applicable to overall system planning as well as to development of options that ensure the objectives of technical development and performance are met within the budgeted life-cycle costs. It is this latter area of risk management to which the concept of warranty development must be addressed.

A critical factor in strategy development is cost. All decisions facing the project or program manager must be weighed against budget constraints for any program to realistically succeed. Warranty decisions are not excepted from this requirement. Although some warranties obtained by the Navy have not been explicitly priced, there is always a cost to administer that should be factored into the life-cycle costing model. [Ref. 10: p. 27] The cost of the warranty must be weighed against the amount of risk transferred to the contractor for system performance. If consideration is not given to this transfer, the effectiveness of the warranty is threatened. Warranty price will increase as the perceived risk increases. [Ref. 1: p. 5-4] If, during the warranty period, the contractor is faced with extraordinarily large losses, the viability of the program may be threatened. This point is especially important when dealing with small businesses as is typical in spare parts procurements. Any conscientious approach to warranty development must ensure an equitable transfer of risk.

3. Warranty Plan

As stated, it is important that a warranty plan be developed early in the acquisition cycle. The final warranty plan must be carefully integrated with all other factors in the tailoring process to be effectively implemented. The selected agreement can affect equipment configuration and design as well as the planning needed to maintain and support the warranted item. [Ref. 1: p. 5-4]

Since the project manager has the overall responsibility for the execution of his program, he is the logical focal point of the warranty development.

Program, engineering, logistics, budget, and contracting personnel need to know the warranty application at hand and the areas of risk where inconsistency between the warranty and program requirement could void the warranty requirements. For example, Government decisions during the functional configuration audit process could affect either warranty performance requirements in the operational field environment or the contractors' liability for engineering redesign as a remedy in ensuring essential performance. [Ref. 1: p. 5-4]

The warranty plan cannot be developed in a vacuous environment. A workable interface between the program office, equipment user, and warranty administrator must exist. [Ref. 1: p. 5-4] As such, the warranty plan must address the following specific issues: [Ref. 1: p. 5-4]

1. Warranted items, coverage, and duration;
2. Maintenance and handling procedures for warranted equipment;
3. Transportation management;

4. Inventory management;
5. Communication of warranty claims;
6. Defense Contract Administration Services (DCAS) and Navy Plant Representative Office (NAVPRO) responsibilities;
7. Configuration management;
8. Funding;
9. Warranty data reporting; and
10. Special training for warranty implementation.

The warranty plan is the program manager's vehicle for addressing the above issues and for ensuring the correct application of the developed warranty agreement. It is this plan that also ensures that organizational responsibilities are known and that appropriate management decisions are made throughout the life-cycle of the fielded equipment. It becomes evident that the warranty plan is also the necessary vehicle to ensure that warranty decisions made during the operational phase of the equipment relating to spare parts procurements are in consonance with the developed system warranty.

4. System Specification

One of the primary elements in development of the warranty is the system specification, which defines the set of system requirements. This is usually developed early in the acquisition but almost in every case prior to the Demonstration/Validation (DEM/VAL) phase. [Ref. 1: p. 5-3]

The requirements of the system specification are translated to development, product, process and material specifications that are expressed in terms of design or performance specifications, or a combination of the two. This is an important consideration in the development of the warranty. Performance requirements allow for greater flexibility in warranty development while design specifications allow for the possibility of future dispute action if the Government-furnished design does not meet specified essential performance requirements as delineated in the warranty agreement. [Ref. 1: p. 5-3]

System specifications are integral to quantifying specific warranty goals and objectives. From a contractual standpoint, a warranty clause cannot stipulate that "the system have a high reliability when used under the conditions for which it was intended." Identifying key essential performance measurements is crucial to implementing the warranty and must be conveyed to prospective bidders in the Request for Proposals (RFP). [Ref. 24] This allows the contractor to structure his proposal in such a way as to be competitive and ascertain his risk in accepting the intended warranty. It also allows him to cost the warranty prior to negotiation so as to realize potential extra profits if the requirements of the warranty are met and exceeded.

Specific requirements that are delineated by the Product Performance Agreement Center (PPAC) in the development of the system specification include: [Ref. 1: p. 5-3]

- Requirements in the system specification and flowdown specifications must be quantitative.
- For requirements to be directly used for warranty coverage, they must clearly refer to the operational environment or special test conditions.
- Methods for measuring conformance to requirements must exist or be amenable to development.
- Only a small subset of specification requirements should be selected for warranty coverage.
- Higher-level, mission-related requirements are generally preferred to sublevel requirements for warranty specification (e.g., speed instead of engine and air-flow parameters, system Mean Time Between Failure (MTBF) instead of unit MTBFs).

The rationale to select only a small subset of specification requirements for coverage must be based on cost and the realities of warranty implementation. In terms of a weapon system, it becomes a monumental task to include every single specification in the warranty coverage. Such a risk transfer would surely make a contractor balk at the potential monetary repercussions. For the Government to unilaterally assign such a risk would surely be cost prohibitive. Also, to administer such coverage is seemingly unmanageable given the level of attention that would have to be given to operational test requirements. [Ref. 24]

The PPAC recommendation to include system parameters vice subsystem or unit requirements is not as self-evident.

While again, system coverage may seem easier to implement and administer, the potential benefits of obtaining specified coverage on select, identifiable components might far outweigh the additional effort expended early in the acquisition cycle. Indeed, the process of delineating essential performance requirements must address the various mission-related requirements designed into the system. For example, performance parameters for an aircraft must go beyond speed and thrust capabilities. The various components must be gauged as a whole and included in a total package warranty. Missile delivery systems must perform at the speeds required of the engine, as must integral points in the airframe sustain required thrust environments. Essential performance characteristics that are not tailored down to the component level impact heavily on warranty implementation. Flaws in an aircraft speed attainment can be attributed to more than just engine failure. To seek liability in such a situation will probably entail lengthy litigation and result in a Government-funded fix. On the other hand, a failure in a specific engine parameter, delineated in the contract, will increase the Government's opportunity to place liability with the engine manufacturer and gain the full benefits of the warranty agreement.

C. STRUCTURING THE WARRANTY AGREEMENT

The structuring of the warranty agreement for a specific acquisition begins with definitizing the acquisition strategy and the resultant warranty plan. The following general sequence of steps should be considered in developing the applicable coverage: [Ref. 29: p. 5-65]

1. Perform studies to identify characteristics to consider for warranty/guarantee and identify candidate approaches.
2. Develop criteria and models and collect applicable data to perform evaluations.
3. In conjunction with technical, user, logistics, and contractual personnel, develop candidate approaches and assess the feasibility of candidate approaches, including consideration of warranty implementation and administration.
4. Develop preliminary clauses or draft provisions and provide "trial balloons" to potential contractors.
5. Issue a Full-Scale Development (FSD) Request for Proposal (RFP) with "expected" warranty/guarantee provisions for the production contract.
6. Finalize warranty/guarantee terms and conditions for the production RFP.
7. Develop a warranty/guarantee selection strategy and a decision model.
8. Issue an RFP with warranty/guarantee option.

Utilizing the above approach allows the Government to price specific warranty coverage prior to negotiation and perform the necessary cost-benefit analysis. There are inherent advantages and disadvantages in each of the MTBF, RIW, and other available guarantee arrangements. Tailored

coverage can effect the degree of contractor risk (and resultant price), administration difficulty, enforceability risk, contractor motivation, and the type of remedies provided. [Ref. 29: p. 3-10]

An effective warranty agreement must address two basic issues: [Ref. 29: p. 3-10]

- Obligational viewpoint - Develop a warranty that will obligate the contractor if the product is not satisfactory, i.e., an assurance warranty.
- Motivational viewpoint - Develop a warranty that will motivate the contractor to provide a quality product, i.e., an incentive warranty.

An assurance form of warranty is easier to administer and implement. As previously discussed, a breach occurs only when the number of failures exceeds a stated threshold. There is no stated or implied incentive for the contractor to exceed the specified parameters. On the other hand, an incentive warranty requires additional contractor investment to reduce the failure level to a minimum and, as such, reduce his overall costs. From a Government stand-point, incentive warranties are costly. There is greater contractor risk at stake in designing and producing a system that exceeds the stated minimum performance requirements.

In reality, very few agreements are purely assurance or incentive-type warranties. Warranties that identify essential performance requirements may not provide a direct incentive to exceed those set parameters. However, there is

also the requirement to warranty against defects in materials and workmanship. This coverage can apply to all defects, regardless of performance characteristics and provides an inherent incentive in that the contractor's liability is decreased for the elimination of all failures. For example, an essential performance warranty might require a population MTBF of 1000 hours for an aircraft engine. Even though the calculated population MTBF might be 1200 hours, a defect in any one engine could require corrective action under the provisions of the materials and workmanship clause.

1. Acquisition Factors

The following acquisition factors play an important role in developing and structuring the warranty agreement.

[Ref. 1: p. 4-1]

- Development history - Detailed data on the system should be used to determine potential problem areas on which the warranty might focus. Prediction and test data can help define quantitative warranty requirements.
- Small versus large buy - The larger the buy, the greater the potential risk to the contractor if warranty terms and conditions are not met. Generally, the severity and scope of the warranty terms may vary as the procurement quantity increases. For a small buy of large, expensive items, the warranty duration can be on an item-by-item basis. For a larger unit buy, the warranty duration may be on a population basis, such as a single end date for all units [of a particular quantifiable lot].
- State of the art - The greater the technological challenge, the more difficult it will be to structure a fair warranty at an equitable price. Equipment that does not "push" the state of the art or that severely

pushes the state of the art is a candidate for an assurance type of warranty.

- Competition - The degree of competition will normally affect warranty price and the contractor's enthusiasm to undertake or bid a warranty with some risk. Without competition, it is generally better to impose warranty requirements rather than have the sole-source contractor bid. The warranty terms should not inhibit plans for competing future production contracts. For example, use of an RIW rather than organic maintenance may not be advisable if future production contracts are to be competed.

For purposes of this study, the consequences of future competition is of particular concern. A pure RIW agreement obviates the need for competitive breakout of the system repair parts as all repairs are the liability of the prime contractor. However, the military environment poses some important considerations on this contractual agreement. The mission of the Navy involves complete mobility and, as such, some degree of organic maintenance. Some systems or components lend very well to a "no-maintenance" concept and can rely on adequate replacement spares to ensure a necessary level of reliability. Others do not. No ship has the capability to carry a spare radar system onboard and therefore must carry spare components or parts. The structured warranty agreement must address the level to which such spares are provided. If the operational tempo increases to a level that requires additional spares to maintain the same level of reliability, who is to fund such an increase? If the level is outside the requirements set

out in the agreement, the additional liability must rest with the Government. At this point, what obligation does the Government have to procure spares from the system warranty holder? This issue must be addressed during the system acquisition process and will be explored in the following chapter of this study.

2. System Factors

As previously discussed, the system characteristics play an important role in tailoring the warranty agreement. The following factors should be evaluated in the process.

[Ref. 1: p. 4-1]

- Electronic versus mechanical - This characteristic can be important for determining warranty duration and predicting reliability. Many electronic systems have a relatively constant failure rate, which makes warranty duration a less important factor than for mechanical systems subject to wear-out. For example, there are several well publicized cases of cracks developing in military aircraft structural members after several years of operation. Because of the greater uniformity of electronic devices, a large body of data has been amassed that is useful for reliability predictions. Thus, there will generally be more confidence in a warranty analysis of electronic systems than in an analysis of mechanical systems with only a limited historical data base.
- Transportability - This characteristic refers to the ability to ship failed units for warranty claim action. Neither units bolted to a ship nor space systems are very transportable, therefore a warranty remedy involving in-plant contractor repair is not feasible. The degree of ruggedization and costs of shipping are also factors to be considered in developing warranty terms and conditions that require transporting units to another facility.
- Field testability - The ability to determine reliability at an intermediate maintenance facility whether or not a

unit is failed is important in establishing a maintenance concept under warranty. For example, if equipment is not available to test units at a base ship, then a large number of units that test OK may be sent to the contractor for warranty action. This can be costly if the contractor can charge for processing non-failed units.

- Warranty markings and seals - Units should be clearly marked that they are under warranty, and brief instructions should be provided as to disposition. If a unit cannot be so marked, or if it cannot be protected against unauthorized maintenance (e.g., through seals), the warranty terms and conditions should be adjusted accordingly.

3. Operational Factors

In addition to acquisition and system factors, the operational characteristics of the fielded system must be considered. Specifically: [Ref. 1: p. 4-2]

- Installation cycle - The length of time from acceptance of the unit to installation should be considered when establishing the duration of the warranty. Either the average installation period can be added to the length of the warranty, or the warranty can be defined upon installation.
- Operating cycle - This factor relates to system usage being one-shot, such as a missile; intermittent, such as an aircraft; or continuous, such as a warning radar. The type of usage can affect the type of reliability performance parameter that is to be controlled, as well as the feasibility and method of measuring success or failure of the item in field use. For one-shot usage, success probability is the most applicable reliability parameter; for intermittent usage, mission reliability or MTBF is generally used; and for a continuously operating system, operational availability is usually appropriate.
- Existing military maintenance capability - If a military maintenance capability already exists, a warranty that requires establishing a contractor repair facility may not be cost effective. This does not rule out alternative forms of remedy that do not require contractor repair facilities.

- Performance measurement - The ability to measure performance parameters is critical when establishing the essential performance requirements. Elapsed time indicators on units may be used to record operational usage, and maintenance records maybe used to record failures. However, in many cases special data collection methods may have to be implemented or special operational tests conducted.
- Pipeline factors - The transportability of the units, the length of the pipeline, the sparing level, and the cost of spares all influence the maintenance concept under warranty. Government repair using bill-back procedures should be used when contractor repair is too costly because of pipeline factors.
- Self-sufficiency - In cases where the criticality of the system dictates military maintenance, warranty remedies using bill-back procedures are recommended.
- Transition - The need to transition out of warranty can influence the warranty structure. Thought has to be given to a one-time versus a phased transition, especially if the contractor is performing depot maintenance.

D. WARRANTY TERMS AND CONDITIONS - CLAUSE DEVELOPMENT

The clauses that comprise the warranty agreement must explicitly detail both the contractor's and Government's obligations toward warranty implementation. [Ref. 1: p. 4-5] While a number of standard clauses exist within DoD usage, the end-product must fit the acquisition, system and operational characteristics of the warranted item. Basic considerations include item identification, coverage, remedy, and duration.

Regardless of coverage selection, an initial concern in developing the agreement is to ensure that Government inspection and acceptance does not void or dilute the

warranty. [Ref. 1: p. 4-5] A typical statement is as follows: [Ref. 1: p. 4-5]

Notwithstanding Government inspection and acceptance of supplies and services furnished under this contract or any provisions of this contract concerning the conclusiveness thereof, the contractor warrants that items [delineate covered items] will meet the conditions specified below...

1. System/Equipment Identification

The terms and conditions should clearly delineate the items to be included in the coverage. This is generally done by contract line item reference. A provision can also be included to cover items installed in the repair process. For example: [Ref. 1: p. 4-5]

This warranty covers line items 001AA through 001AF and each component thereof, including items subsequently installed by either the Government or the contractor to correct a defect.

Inclusion of this type of provision will allow the Government a great deal of leeway in developing subsequent spares warranties. However, the contractor must accept such a provision and may do so only at a significant price.

Additional considerations must include system definition and further definition of the related components, modules and parts that comprise the system. This is important in delineating specific coverage and defending possible future litigations regarding contractor liability.

2. Design and Manufacturing Control

In conformance with the statute, a clause must be included to warrant weapon systems against defects in design

and manufacturing. A standard clause is as follows: [Ref. 1: p. 4-5]

The contractor warrants that [line items] will conform to all design and manufacturing requirements specifically delineated in this contract [applicable sections] and in any amendments thereto.

An additional clause would be inserted to limit the contractor's liability with regard to Government Furnished Equipment (GFE) as specified in the statute and DFARS requirement.

3. Defects in Materials and Workmanship Control

An additional clause is required to cover defects in materials and workmanship as per the statute. A generic clause is as follows: [Ref. 1: p. 4-6]

The contractor warrants that line items provided under this contract are free from all defects in materials and workmanship at the time of acceptance (or delivery) [applicable specifications or contract provisions may be referenced].

The inclusion of the phrase "at time of acceptance or delivery" controls latent defects. It also leaves open to dispute that any defects discovered during the warranty period were present during acceptance or at time of delivery. To mitigate this liability, the contracting officer may omit the phrase and extend the coverage for the warranty period. However, this involves a further shift of risk to the contractor and, as such, additional costs.

4. Essential Performance Requirements

The inclusion of this provision in the warranty agreement directly implements the requirements and legislative intent of the statute. As previously discussed, the contracting officer has a variety of options that should be judiciously considered in consonance with the acquisition strategy. Generally, selected requirements should be included rather than a broad system requirement which might state that the contractor guarantees that all performance requirements in this contract will be satisfied. The delineated requirements statement specifies line items within the contract and assigns individual essential performance requirements to each sub-system or major component. Reliability is used to gauge satisfactory system performance and can include "catastrophic failure (e.g., short circuit of an electronic module) as well as design or performance failure (e.g., inability of a radar to locate or track a target)." [Ref. 1: p. 4-7]

Specific examples of clauses that may be used integrating a reliability-related parameter are as follows:
[Ref. 1: p. 4-7]

- a. Mean Time Between Corrective Maintenance Actions-Individual System. This provides a control on MTBF for each delivered unit and is applicable for small buys of very large units:

The contractor guarantees that each XYZ system will maintain a mean time between corrective maintenance

actions of _____ hours for the period specified in paragraph_____.

- b. MTBF Control of Population. For smaller units, it is usually better to place the reliability control on the population of units:

The contractor guarantees that the MTBF for the population of all delivered systems will be _____ hours when measured in accordance with the procedures delineated in paragraph _____.

- c. Engine Performance Parameters. Engine Warranties provide good examples of essential performance requirements not specifically related to reliability. For example:

The contractor warrants that the performance of each engine delivered, for the period specified shall not be less than 95 percent of the intermediate thrust as set forth in specification ABC and shall not exceed 104 percent of the intermediate fuel consumption as set forth in specification DEF.

- d. Failure Threshold. For an assurance form of warranty in which the contractor is liable only for failures that exceed a threshold, a typical clause is as follows:

A threshold number of _____ valid warranty failures of depot-repairable parts is established during the specified warranty period. The contractor shall be liable for the repair/replacement costs of all valid warranted failures that exceed this threshold number during the warranty period.

5. Warranty Duration

The duration period of the warranty coverage is a major element in the agreement. "Warranty cost, incentives, administrative factors, investment decisions, risk, and other factors are all keyed to the duration." [Ref. 1: p. 4-8] In consideration of these factors, there

are many alternatives available, including the following:

[Ref. 1: p. 4-8]

- Duration applies to individual items versus lots.
- Duration starts with delivery (or acceptance) versus installation versus some other event.
- Duration is in terms of calendar time, operating time, or a combination [e.g., 5 years or 50,000 miles, whichever comes first].
- Warranty period can terminate early or be extended, depending on the item's performance.

6. Conformance Determination

The warranty agreement should be explicitly clear how conformance to the requirements is to be verified. Without such a determination procedure, the Government assumes that all failed units within the specified period are subject to the contractor's liability. If the contractor does not agree, then it becomes a matter of dispute that may involve litigation. To minimize this risk, the contract can state "a presumption of failure" and place the burden of proof on the contractor, or specify a failure-verification procedure. Example clauses as follows:

[Ref. 1: p. 4-9]

- a. **Presumption of Failure.** It is presumed that all items sent back for a defect in materials and workmanship or in design and manufacturer are covered by this warranty, unless the contractor can present clear and convincing evidence to the Government otherwise.
- b. **Specified Verification Test Procedure.** Units returned for warranty correction are presumed to be defective, unless the contractor can show otherwise, using the applicable test procedures specified in document XYZ.

Obviously, the more complex nature of the system, or of the coverage, will require more complex performance tests. A general statement used to indicate a special test to verify conformance is as follows:

During the period specified in paragraph _____, the Government will conduct an operational countdown test in accordance with the procedures specified in document XYZ in order to verify conformance to the stipulated essential performance requirements. The contractor may witness such tests at no additional costs to the Government. . . . [Ref. 1: p. 4-9]

7. Exclusions

Exclusionary clauses are necessary to the agreement to limit the contractor's risk for defects that are beyond his control. Such clauses must be carefully worded to ensure they are invoked only for the purpose for which they were intended. A general clause is as follows: [Ref. 1: p. 4-11]

The contractor shall not be liable under the terms of this warranty for any failures that occur as a result of [examples include:]

- Accidents
- Acts of God
- Combat damage
- Fire, submersion
- Foreign-object damage
- Government misuse, mishandling, repair, or installation not in accordance with prescribed procedures
- Nonapproved storage, crating, or packaging
- Sabotage, vandalism.

8. Contractor Obligations

The clauses that fall under the category of contractor obligations are necessary to implement the warranty and further define the contractor's risk. Of paramount importance is the specified remedy to correct a warranted defect. Again, the nature of the acquisition and the system define the appropriate remedy. As specified in the DFARS, the following are the three basic options:
[Ref. 4: p. 46.770-2]

- Contractor implements a corrective action.
- Contractor pays costs reasonably incurred by the [Government] in taking necessary corrective action.
- There is an equitable reduction in contract price.

Actual clauses may make use of one or more of the specified remedies, depending on the circumstances.

Additional clauses defining the contractor's obligations in implementing the warranty are as follows:
[Ref. 1: p. 4-13]

- Transportation. Usually the contractor pays for all transportation involved in shipping and returning the warranted item. However, consideration may be made to the contractor's risk involved for widespread deployment of the item.
- Warranty Data and Reports. This includes such coverage as configuration control and the furnishing of the necessary data for warranty analysis. Such data would be necessary to meet the Navy's requirement for warranty feedback information. [Ref. 26]
- Warranty marking. An important clause to warranty administration. Elements would include the DFARS

requirements governed by MIL-STD-130 and MIL-STD-129 and also the specific Navy marking requirements. [Ref. 26]

- Warranty Seals. If the warranty is voidable through Government repair, a clause requiring equipment seals should be considered. The contractor can be made liable to prove that seal breakage was not inadvertent to further reduce the possibility of disputes. [Ref. 1: p. 4-13]
- Installation of Warranty Engineering Change Proposals (ECP). The contractor can have the option to introduce an ECP to reduce future failures. Such a clause would require the contractor to install the approved ECP in all warranted equipments. [Ref. 1: p. 4-13]
- Technical manuals. A clause should be used to ensure that all appropriate warranty information is included in the provided technical manuals. This also can be instrumental in administering the warranty.

9. Government Obligations

To further define the warranty-related risk, the contract should specify those obligations the Government must fulfill to implement the warranty. Such definition reduces the possibility of future disputes. Those areas include:

- Warranty Administration. Implementation of the warranty requires the Government (specifically, the agency) to establish an administration plan, delineating procedures and responsibilities. On a macro scale, the Government should protect its rights provided in the warranty agreement. For example, the Government should include a clause in the contract allowing for cancellation of the warranty with a negotiated equitable adjustment. [Ref. 1: p. 4-14]
- Testing and Verification. A clause should be included stipulating the Government's right of testing and verification. This can include determination that an item is failed, system performance criteria have not been met, or stipulation that the verification of seal breakage rests with the Government. [Ref. 1: p. 4-14]

- Notification. A clause should be included stating the Government's obligation to notify the contractor of a warranty breach. Specified time limits for notification will limit the contractor's liability for warranted failures not reported within the duration period.
- Shipping. Most likely, the shipment of warranted items will be accomplished at some point within the Government transportation system. A clause should set out shipping requirements in terms of packaging and marking.
- Data. Some warranty coverage will necessitate the Government's compilation of data to determine conformance. For example, this is particularly true of the MTBF - population coverage. A clause should set out the Government's obligation to provide such data to the contractor to benefit the contractor in failure analysis and repair. [Ref. 1: p. 4-15]
- Maintenance. In most cases, particularly in the case of a war-deployed system, the Government will retain the right of system maintenance. To limit the contractor's liability, a clause should be used to specify under what circumstances maintenance will be performed and stating that qualified personnel and up-to-date technical manuals will be used.
- ECP approval. If a no-cost ECP is submitted by the contractor to correct a warranted defect, the Government should state its obligation to approve such an ECP in a timely manner. [Ref. 1: p. 4-15]

E. ROLE OF THE PRODUCT PERFORMANCE AGREEMENT CENTER

The Air Force Product Performance Agreement Center was established to assist the acquisition process in the selection and use of specific warranty forms. [Ref. 30: p. i]

Specifically, the PPAC is charged with : [Ref. 30: p. 2-1]

- Serving as the central repository of Air Force Product Performance Agreement (PPA) related data.
- Analyzing the effectiveness of existing and proposed warranties, guarantees, award fees, incentives, related contractual provisions, solicitation instructions, and

other PPA associated contracting strategies and/or management and administration systems.

- Developing improved contract clauses and related concepts as well as methodologies for selecting appropriate and cost effective PPAs.
- Providing technical assistance to Air Force activities in selecting, tailoring, pricing, negotiating, and administering appropriate agreements through:
 - Direct consultation with program/system managers and staff;
 - Periodic publication of guides, handbooks, and/or technical reports and;
 - Periodic sponsorship of workshops, symposia, briefings, and other communications designed to improve Air Force wide use of PPAs.
- Formulating proposed policy guidance for Headquarters USAF consideration concerning application of PPAs to Air Force acquisitions.

The Air Force's lead in recognizing the benefits of such an organization as PPAC has been acknowledged by the other Services. The structure, use and implementation of warranties was a complicated process even before the current legislation. As discussed, successful implementation is dependent upon the collection and dissemination of usage data. It is inherent to the cost-benefit analysis process and, on a practical basis, even more useful as far as building a "lessons-learned" file. It would seem impractical for DoD, as a whole, to duplicate the efforts of the PPAC that have been underway since 1982.

During the time frame of this research, a Memorandum of Agreement on a Joint Warranty Data Exchange for the Army,

Navy, and Air Force has been signed. [Ref. 31] Its purpose is to delineate the actions of each Service in establishing a program to foster the exchange of warranty information with minimal potential for duplication of effort. Within available resources, each Service

will provide copies of warranty clauses, program assessments, lessons learned, command level analysis reports, regulations, policy documents, handbooks, computer model descriptions, data collection and analysis program descriptions, warranty plans, technical reports, and studies to the other services as required. [Ref. 31]

On a practical basis, the Decision Support System maintained by PPAC is the vehicle available to accomplish this wholesale exchange of warranty information. The Decision Support System (DSS) includes a library query system of warranty data maintained in the PPAC hard-copy library. Utilizing a locally-available personal computer terminal, program offices can access the library via a modem and conduct an on-line search for relevant information to selected warranty types. Additionally, PPAC maintains an on-line model for selecting, analyzing and structuring specific warranty/guarantee forms.

This researcher has used the PPAC system and found it to be very effective and easy to use. However, the current volume of warranty-related studies and reports is dwarfed by the information available from the Defense Logistics Studies Information Exchange (DLSIE).

F. COST-BENEFIT ANALYSIS

In determining if a warranty is cost effective, "the analysis should examine a weapon system's life cycle costs, both with and without a warranty. . . ." [Ref. 4: p. 46.75] As such, all acquisition, operation, and support elements that are a part of life-cycle costs and that are affected by warranty coverage should be reviewed. [Ref. 10: p. 91]

A current General Accounting Office (GAO) report reviews the level of implementation of the warranty legislation within each of the Services. [Ref. 32] In the report, ninety-seven contracted warranties were reviewed and only nine were found to have completed cost-benefit analyses. No such analyses were prepared for the following: [Ref. 32: p. 30]

1. 52 warranties with identifiable warranty prices (including three warranties priced at \$0) totaling \$180 million;
2. 16 warranties that were not separately priced; and
3. 20 warranties for which the warranty price had not yet been definitized.

Various reasons were obtained for not performing cost-effectiveness analyses, including the following: [Ref. 32: p. 33]

1. The warranty price fell within what was considered an acceptable percentage of the contract price;
2. No model or historical data were available to perform the analyses;
3. The procurement was competitive; and

4. The warranty was not separately priced or was considered a no-cost warranty.

DoD policy states that warranty costs are to be specified either in the contract or in the contracting officer's documentation supporting contract negotiations. [Ref. 4: p. 47.770-8] The policy defines a cost-effectiveness evaluation as relating warranty benefits to warranty costs. It also identified the following cost analysis factors for consideration in the evaluation: [Ref. 32: p. 32]

- the contractor's fee for the deferred liability under the warranty
- the Government's administration and enforcement costs
- the effect of competition on the warranty price
- the cost of correction or replacement without a warranty by the contractor, Government, or another source
- Indirect Government costs, such as the effect on logistics support capability, breakout, and competitive procurement of system components.

In this research's view, the reasons given by the Services for not performing cost-benefit analyses in those cases identified in the GAO report do not seem to provide adequate justification. Even though competitive procurements provide reasonable assurance that fair and reasonable prices are obtained, it is still possible that the procurement could be more cost-effective without a warranty. While cost-benefit analyses cannot be prepared when warranties are not separately priced, this certainly

argues for obtaining the warranty price so that an analysis can be prepared. Also, although it appears on the surface that no-cost warranties would inherently be cost-effective, other costs and conditions must be considered, such as the administrative burden and the effect on operations of having to maintain control over warranted parts. Also, additional quantities of parts may be required to compensate for return and repair time, downtime, and storage time.

It is not the purpose of this research to identify and evaluate the myriad of cost-benefit models that are currently available within DoD and the literature that can be applied to the warranty. All three Services have developed and are developing new models for this purpose. The Army has issued a cost-effectiveness analysis checklist as part of its warranty regulations to ensure that such analyses are performed. [Ref. 33] The Navy has a similar effort underway and the Air Force PPAC Decision Support System includes the Life Cycle Cost Breakdown Model.

The final decision to use a warranty requires full consideration of cost-effectiveness. Many, if not all, of the direct costs involved in a warranty can be easily modeled and data may be available for obtaining parametric estimates. However, some equally important cost factors are not as amenable to modeling but could have a major impact on

a system's life-cycle cost. These indirect costs would include: [Ref. 34: p. 5]

- Competition - the cost of opportunities in the competitive market place for acquisition of equipment and parts.
- Break-out - the cost of opportunities for break-out acquisitions of sub-assemblies and spares.
- Warranty Bail Out - the cost to the Government in the event the contractor fails to fulfill its warranty obligations.
- Technology - the cost of opportunities in technological advances.
- Second-Sourcing - the cost of opportunities in second-sourcing of production units.
- Readiness - the cost of loss of readiness and failed maintenance capabilities in a combat environment.

It is self-evident that the nature of these costs do not lend to easy estimation. Nonetheless, these costs are real in every sense of the word and clearly play an important role in the warranty decision process. As such, use of the available cost-benefit models can only supplement the decision process as is the case in all decision support systems.

G. THE WAIVER PROCESS

Consequent to the cost-benefit analysis process is the waiver decision. The current legislation allows for a waiver of part or all of the coverage requirements of the statute if it is determined (1) that the waiver is necessary in the interest of national defense, or (2) that a guarantee

under the legislation would not be cost-effective.
[Ref. 4: p. 46.770-9]

Aside from two class waivers issued by the Secretary of Defense in the interest of national defense, only two individual waivers for a specific contract have been approved. [Ref. 32: p. 18] In May 1984, the Army waived the warranty in a contract for gyroscope magnetic compass sets used in helicopter navigation. According to the waiver, the inclusion of the warranty required under the statute would have required the Army to recompet the contract and delay the procurement of urgently needed equipment. [Ref. 32: p. 19] The second waiver occurred in 1986 when the Air Force waived the warranty in the acquisition of Rapier Missile Fire Units. [Ref. 32: p. 19] The missiles were being purchased from the United Kingdom under a memorandum of understanding that did not require a warranty. Neither waiver was the result of the contracted warranty not being found cost-effective.

Five additional requests for waivers on specific contracts have been submitted; two by the Army Missile Command, two by the Naval Sea Systems Command (NAVSEA), and one by the Air Force Aeronautical Systems Division. [Ref. 32: p. 19] None were approved. According to the GAO, rather than approve waivers, the Services required procurement officials to renegotiate warranty prices and/or

terms to obtain a warranty acceptable to the submitting activity.

In the Navy case, NAVSEA requested a waiver for a contract on four Submarine Active Detection Sonar Transmit Groups, which are major subsystems of the Submarine Advanced Combat System. It was a cost-reimbursement contract, and the waiver was sought on the basis that warranty provisions were not cost-effective. The request was denied by the Assistant Secretary of the Navy (Shipbuilding and Logistics). The contractor ultimately agreed that claim costs would not be reimbursable, but the contractor's liability was limited to three percent of the target cost. A cost-benefit analysis was not made on the revised contract because NAVSEA officials considered it to be a no-cost warranty and inherently cost-effective. [Ref. 32: p. 21]

The Navy has since issued a policy directive setting forth its position on waivers. The directive emphasizes the need to separately identify performance requirements subject to warranty provisions and states that the proper application of specifications should eliminate the need for waivers. [Ref. 32: p. 21]

Such a position on waivers enforces statute conformance with little regard to the actual benefits derived from the warranty. DoD, together with the defense industry, fought very strongly against the legislation citing the requirement

for an essential performance warranty as inherently cost-ineffective. If this is the case, then DoD has a clear obligation to prove this issue one way or the other. This can only be done through the conscientious application of a cost-benefit analysis and full support of the resultant decision. If a warranty application accumulates conclusive proof that it is too costly and/or ineffectual, than those programs should exercise the waiver contingency. [Ref. 35]

H. WARRANTY ADMINISTRATION

Administering or implementing the warranty must also be addressed early in the acquisition process. Issues previously discussed, involving tailoring the acquisition strategy and the resultant warranty plan, have a direct effect on the subsequent implementation. Depending on the complexity of the warranty being applied, the procedures and interfaces needed for administering the warranty can vary considerably. Where program technical risks are low and a simple warranty is adequate, administration may be as equally non-complex. On the other hand, program risks may call for a more complex, incentive type of warranty that may require extensive Government activities. In structuring the warranty agreement, every effort should be made to keep the administrative tasks to a minimum. The purpose of the agreement should always be at the forefront: quality combat weapon systems. The best way to ensure that the warranty

will be workable is to insist that knowledgeable program and logistic personnel participate in developing the warranty contractual provisions and the implementation plan. [Ref. 1: p. 6-1]

In general, the challenges that arise in administering the warranty pertain to all procurements in DoD and specifically, the Navy. It is true that an incentive warranty for a complex weapon system will require the compilation of complex data (e.g., component data on MTBF measured against specific performance requirements). However, the data compiled for O-Ring failures under a materials and workmanship warranty require equal consideration for future warranty evaluation. To be workable at the fleet level, a conscientious system must be established to collect and transmit the necessary information. Warranties must be structured to enhance fleet readiness in the broad sense. A clumsy, paperwork-ridden administrative system is not only an indirect cost of the warranty but is an impediment to its success [Ref. 24].

The purpose of a warranty administration plan allows for acquisition, logistic, and user organizations to track and administer those equipments covered by contractual warranties, and to provide feedback to the contracting community on the feasibility of specific warranty forms. [Ref. 36: p. 1] The draft Air Force Warranty Administration

Plan requires the identification of the following:

[Ref. 36: p. 1]

- Logistics policy, procedures, and data systems requiring revision or development.
- Offices of primary responsibility and schedules for accomplishing required changes or development.
- Limiting factors and constraints to the application of warranties and their management.

As discussed, developing the warranty for a weapon system and also for the acquisition of related components and subassemblies, is a complex process that requires planning. Implementing the warranty once the contract is signed is equally as complex. To separate the two processes becomes functionally impossible. If warranty remedies remain unused, for whatever reason, the warranty becomes inherently cost-ineffective. As such, a team approach to the entire process becomes of paramount importance. This team should include the program or item manager in addition to the following functions: contracting; logistics; legal; engineering; product and quality assurance; and cost analysis, with support from other functional specialists or organizations, such as PPAC and the competition advocate, as may be required. [Ref. 36: p. 5]

The Navy's Ships Parts Control Center (SPCC) and Aviation Supply Office (ASO) will play important roles in implementing Navy warranties. While formally under the Navy Supply Systems Command (NAVSUP), each has strong ties to

their hardware systems commands in the logistic support of fielded weapon systems. Generally, SPCC and ASO manage the bulk of spare components and repair parts for their counterparts, the Naval Sea System Command (NAVSEA) and the Naval Air Systems Command (NAVAIR) respectively. For example, the return and repair of a failed warranted fuel control valve from an aircraft engine will be coordinated through ASO (irrespective of funding considerations). Likewise, a replacement valve will be ordered through ASO by the fleet user. While NAVAIR is involved in the contracting for certain components, most fleet liaison is with ASO.

This relationship between NAVSUP (specifically, its field activities) and the hardware systems commands complicates the warranty administration issue. In previous years, the workings of an established system would have come under the umbrella of the Navy Material Command (NAVMAT). NAVMAT had primary responsibility for the logistic operations of all the system commands. Unfortunately, NAVMAT has been disestablished and the task of developing a Navy-wide system approach to the warranty administration issue has yet to be undertaken. As previously discussed, the responsibility will rest with the Office of Chief of Naval Operations (specifically OP-04) to implement an administrative plan. [Ref. 26] Ultimately, the final drafter will, in all likelihood, be NAVSUP.

Warranted items will require considerable effort in item identification, marking, tracking failed items through the supply system, data collection, data analysis, and central database development. Although the main body of procurements at SPCC and ASO do not meet the specific requirements for warranties under the statute, the majority of the tracking efforts for all warranties will pass to these organizations. The mechanisms and resources to implement and enforce the warranty must be in place. A dialogue must be established between the hardware systems commands and NAVSUP to make it happen.

I. CHAPTER SUMMARY

This chapter summarizes specific issues relating to the development of the warranty. Development is not a separable function from the other important aspects in developing the acquisition strategy. It cannot take place in a vacuous environment and must consider the established policies and procedures for implementation. The benefits of applying the warranty to specific weapon system components were also discussed. Structuring the warranty agreement was examined in detail. The functional clauses that make up the warranty form were discussed as well as their potential impact on specific issues relating to spares procurements. The Air Force PPAC has the potential to play an important role in the warranty process. The DoD-wide use of the PPAC Decision

Support System can greatly enhance the effective implementation of the legislative requirement. Also discussed was the importance of a conscientious approach to cost-benefit analysis and the potentially consequent waiver process. The chapter concluded with a discussion of warranty administration, its purpose and its potential impact on the Navy's Ships Parts Control Center and Aviation Supply Office.

Chapter V will specifically address the spare parts warranty and discuss the consequent administration issues.

V. SPARE PARTS WARRANTIES

A. INTRODUCTION

This chapter will focus on the application of the warranty to spare parts procurements. It will first definitize the Navy's concept of spare parts then highlight the major similarities and differences between the spares warranty and the major weapon system warranty. Included in this discussion will be unique administrative issues that affect each type of warranty. Also, the competition issues surrounding spare parts procurements will be explored. The chapter will conclude with a discussion of some of the warranty initiatives currently underway that pertain to the spares.

B. SPARE PARTS DEFINED

There has been little study done on applying the warranty to spare parts procurements. The DFARS policy specifically exempts "spare, repair, or replenishment parts" from the statutory requirement for a mandatory written warranty. [Ref. 4: p. 46.703]

Relevant to the issue is the definition of spare or repair parts. "Weapon System" has been defined in the DFARS as any "system or major subsystem used directly by the Armed Forces to carry out combat missions." It further provides

examples such as vessels, bombers and fire control systems and specifies that the term "weapon system" does not include any commercial items sold in substantial quantities to the general public. However, there is no clear cut definition of a "major subsystem". One might infer that a major subsystem is a system that can be placed within or onboard another system. For example, a fire control system can be placed onboard a ship or incorporated into an avionics suite. Without further guidance, it is difficult to ensure the intent of the regulation is faithfully carried out.

The Naval Supply Systems Command (NAVSUP) has provided specific definitions to be used for material identification and procurement. [Ref. 37: p. 14001] A repair part is defined as

. . . an integral manufactured and replaceable part (or assembly) of a piece of machinery or equipment, the part being furnished normally for replacing a part worn or damaged in service.

The NAVSUP publication further defines the terms "part", "assembly", "subassembly", "unit", "group", "set", "accessory", "attachment", and "system". Without belaboring the semantics of the different definitions, it is apparent that the distinctions between the different items are not always clear. An assembly in one instance may be also a subassembly in another application. For purposes of this study, spare and repair parts will comprise the majority of

items purchased by the Aviation Supply Office (ASO) and Ships Parts Control Center (SPCC).

C. SPARE PARTS WARRANTIES VERSUS WEAPON SYSTEM WARRANTIES

1. Similarities

A warranty has been defined as a promise or affirmation given by a seller to a purchaser regarding the nature, usefulness, or condition of the supplies or performance of services to be furnished. The principal purposes of the warranty are to delineate the rights and obligations of the contractor and the Government for defective items and services and to foster quality of performance.

This widely accepted definition makes no distinction regarding weapon systems or spare parts. In fact, to make such a distinction is contrary to the intent of the statutory requirement. It makes little sense to pursue quality in DoD weapon systems while repairing those systems with inferior spares. Whether or not wholesale application of weapon system warranties to spares is the best method of achieving this quality requires exploration.

Developing a warranty for spare parts requires much of the same analysis necessary for developing a warranty for a major system. Both types exhibit the same cost-effectiveness criteria, are tailored for the individual procurement, and clearly set out the rights and

responsibilities of both contractual parties in the warranty provisions.

Specifically, most spares warranty developments require a warranty plan for each procurement documenting the responsibilities, decisions, taskings and strategies for the warranty. In most cases, this plan may be developed during the initial spares buy and updated as necessary during the life-cycle of the equipment as circumstances change. For example, the plan could be updated when the duration of the system warranty ends or it is determined that claim processing costs are exceeding claim recovery costs for a particular spare. Planning areas that should be documented include: [Ref. 1: p. 2-8]

- Brief statement of the need and summary of the technical and warranty history
- Responsible action point, contracting officer, warranty manager, and other points of contact deemed necessary for warranty administration
- Organization responsibility for warranty management
- Duration, marking, measurement basis, reporting, disposition, material accountability, and other information pertaining to the administration of the warranty
- Cost-benefit analyses documentation
- Type of warranty coverage
- Procedures for tracking and accumulating warranty costs.

The type of coverage selected for the system spares will dictate the complexity of the formalized warranty plan.

The method for structuring the specific warranty form is very similar to the method employed for structuring the weapon system warranty. The same generic factors outlined in Chapter IV can be applied:

- Acquisition factors
- Spares characteristics
- Operational factors.

Consideration of these factors in structuring the spares warranty will not necessarily result in the same coverage dictated for the system warranty. Specific differences in the factors as well as other important considerations may obviate the need for any type of warranty coverage whatsoever.

Structuring the form of the spares warranty also parallels that of the system warranty. [Ref. 1: p. 4-4] While it is in the Navy's best interest to utilize standard "boilerplate" clauses to the greatest extent possible, structuring the warranty must follow a well defined plan. Standard clauses greatly benefit the acquisition process through the timeliness and ease of applicability but may inadvertently place the Government or the contractor in an unanticipated risk situation. [Ref. 1: p. 4-4] Warranty users must tailor clauses to fit the acquisition, equipment, and operational conditions peculiar to the procurement. This tailoring process as applied to spares procurements may

be quite simple, however. The complexities of a weapon system necessarily require a more complex decision process. Some spares procurement are straightforward and only require adequate consideration of the same clause forms to ensure the contractual rights and responsibilities are clearly defined. These forms include [Ref. 1: p. 4-5]:

- Precedence of the warranty over inspection and acceptance. This statement is required of all warranty applications.
- Equipment Identification.
- Defects in Materials and Workmanship Controls. Applicable to all warranties to control latent defects.
- Other warranty Controls as applicable. If the warranty plan requires Design and Manufacturing control and/or Essential performance Requirements they must be clearly delineated.
- Warranty duration. The warranty plan must address duration in consideration of the system warranty and other generic factors discussed in Chapter IV.
- Conformance Determination
- Exclusions
- Contractor obligations
- Remedies
- Transportation
- Warranty Data and Reports
- Warranty Marking
- Warranty Seals
- Installation of Warranty Engineering Change Proposals
- Technical Manuals

- Government Obligations
- Warranty Administration
- Testing and Verification
- Notification of Claims
- Government furnished warranty data
- Maintenance
- ECP approvals

Many of the above listed considerations are easily adapted to standardized clauses for use in all spares warranties. For example, in this researcher's opinion, warranty administration procedures will eventually be standardized. However, other clauses should fit the individual procurement. Whether or not the warranted spare will be subject to intermediate and/or organic maintenance or utilize a "no-maintenance" concept, must be specifically addressed in the contractual provisions [Ref. 1: p. 4-12].

The greatest degree of similarity between the weapon system and spare parts warranty is in the area of administration. While enforcement concerns may differ, the administrative system should be identical to minimize the burden of implementation at the fleet level. As previously discussed, the Navy has yet to fully develop an implementation plan that will facilitate the large scale requirements of a spares warranty scenario. System warranties are still few in number and can almost be managed

on a case-by-case basis. However, once the fleet user faces an inventory comprised of warranted spares, all of different types and durations, a clearly defined workable system applicable to all warranties becomes clearly necessary. Such a plan should embrace the following considerations:

[Ref. 1: p. 6-5]

- Pre-warranty-period activities (e.g., develop warranty plans, develop training responsibilities (i.e., Type Commander Readiness Support Groups))
- Warranty-period events (e.g., organic maintenance plans, second-sourcing plans)
- Post-warranty-period activities (e.g., assessing warranty cost-benefits)
- Procedures for issue and receipt of warranty assets
- Retest-okay processing procedures
- Transportation procedures
- Contracting data and reporting requirements
- Packaging requirements
- Transportation and packaging funding considerations
- Damage reporting
- Storage requirements (e.g., segregation from non-warranted items in inventory similar to shelf-life items)
- Commingling of warranted and nonwarranted assets at stock points and in the fleet.
- Considerations of stock-issue priorities
- Communication procedures for maintenance and utilization data
- Description of DCAS responsibilities.

Although resultant warranty decisions regarding major weapon systems and spare parts may differ considerably, the decision making process has many similarities. When found cost-effective, warranties can achieve the same benefits in the area of spare parts as delineated for systems in Chapter II.

2. Differences

The statutory requirement of a written warranty does not apply to spare parts procurements. [Ref. 4: p. 46.703] specifically, the DFARS states that "all subsystems and components will be procured in such a manner so as not to invalidate the weapon system warranty." [Ref. 4: p. 46.770-3]

This is an obvious important consideration in determining the applicability of a warranty to any spares procurement. It makes the assumption that the system warranty is cost-effective and that definitive guidance on the spares warranty is communicated from the hardware system command to the field contracting system. Without this communication, field warranty efforts may be counter productive and result in greater overall life-cycle costs.

The major differences in applying the warranty to spares rests in the nature of the buys and the type of equipment being procured. Major system acquisitions, as discussed in Chapter IV, require complex planning, major

staffing, and full consideration of both funding and political pressures. It is a lengthy process in which the warranty consideration is but one small aspect. Spare parts procurements differ immensely. Buyers usually work under the pressures of time and personnel shortages to meet immediate fleet needs. While many procurements for stock replenishment take economic order quantities into consideration, there are necessarily spot buys of small numbers to meet operational requirements. As such, a formalized approach to warranty development is seen as a hinderance to acquisition streamlining in the Navy Field Contracting System. Recent initiatives, such as the Productive Unit Resourcing System (PURS), place a great incentive on the supply system to streamline the process as much as possible. Consistent preparation of lengthy warranty plans for inexpensive spares may not be cost effective for the buying command while still cost-effective for the Navy as a whole.

As discussed, the term "spare parts" refers to a broad classification of items. It includes spare aircraft engines as well as O-rings and sheet metal screws. In some cases, the inclusion of Essential Performance Requirements is not only cost-ineffective but impossible as well. When does an O-ring cease to perform like an O-ring? What type of tests could be conducted that are of a non-destructive

nature to ensure continued performance throughout the duration of coverage?

Determining the type and level of warranty coverage for the myriad of parts procured by the Navy Field Contracting System is a complex undertaking. In addition to consideration of the equipment and operational factors discussed in Chapter IV, ample consideration must be given to the original system warranty. Some spares have clearly defined interfaces. Many avionic spares utilize "black box" technology that allows for easy fault isolation. A spare failure has little impact on the system as a whole. The failed part is simply removed and replaced and can be shipped off for warranted service.

This is a different scenario from some other types of systems. A failed circuit card in a fire control radar may wipe out an entire assembly. In this case, the failed spare may invalidate the original equipment manufacturer (OEM) warranty regardless of the warranty coverage of the individual repair parts. Determining the degree of system interface requires a level of technical expertise that may not be available in the field contracting system.

Spare parts also lend to marking problems. While a spare motor or engine can easily be marked in accordance with the proposed NARSUP requirement, nuts and bolts can not. Warranty information could be attached to packing but

enforcement could become a problem at the fleet level. As warranted parts become incorporated into the fleet inventory, like spares will have different duration periods and some older spares may not have a warranty at all. To implement the warranty once the part has been placed in the equipment will be almost impossible in most circumstances when it is not marked. The user must know what is warranted and how to effectively enforce the provisions.

Another consideration between the system warranty and the spare parts warranty is the cost to administer. For a system warranty to work, it must be explicitly priced. While there are inherent problems in performing effective cost-benefit analyses, it is clearer for the number of major weapons being introduced to the fleet. The Navy Supply System already has a repairable retrograde management system in place. The majority of warranted systems will already meet the system's criteria for turn-in. However, widespread use of warranties for all repair parts will surely tax this system and substantially increase the workload of the fleet users. Shipboard squadron supply personnel will have to track, package, and ship all failed parts that are covered by a warranty. This may or may not be cost effective. However, the systematic use of warranties for spare parts will generate an administrative cost that will have to be analyzed on a macro scale.

D. COMPETITION ISSUES

The Defense Acquisition Regulation Supplement No. 6 requires the Services to conduct "breakout" reviews of all replenishment spare parts with an annual buy value greater than \$10,000 which are also coded for sole source procurement. [Ref. 38] "Breakout" refers to the detailed data screening and identification process that leads to a decision that an item can be procured from other than the historical sole source. [Ref. 39: App. F] The stated objective of the program is : [Ref. 38: p. 56-102]

. . . to reduce costs by "breakout" of parts for purchase from other than prime weapon system contractors while maintaining the integrity of the systems and equipment in which the parts are to be used. The program is based on the application of sound management and engineering judgement in (i) determining the feasibility of acquiring parts by competitive procedures or direct purchase and (ii) overcoming or removing constraints to breakout identified through the screening process (technical review). . . .

The program is comprised of two types or levels of technical review: full screen breakout and limited screen breakout. [Ref. 39: App. F]

A full screen review entails a 65-step process including data collection, data evaluation, data completion, technical evaluation, economic evaluation and supply feedback, which is to be performed on items above the \$10,000 threshold with a forecasted buy within the next 12 months. The decision whether or not to breakout the item is based upon the technical data available at the Inventory Control Point (ICP) [The Navy Aviation Supply Office and the Navy Ships Parts Control Center] and the Engineering Support Activity responsible for the life cycle management of the part and its parent system.

[Limited Screen breakout refers to] limited screening of one type or another that can be performed by any procurement activity which also has a technical section (e.g., the ICP's or Naval Supply Centers). The breakout decision is made by the procuring activity based upon the data available to the technician on site, or that data which can be furnished in a timely manner by the customer. For this reason, successful limited screen breakouts usually involve material which is not highly technical in nature and for which it is readily apparent that the sole source contractor adds no value whatsoever.

The result of the screening processes is the assignment of an Acquisition Method Code (AMC) and the subsequent assignment of an Acquisition Method Suffix Code (AMSC) which further describes the AMC by adding information concerning the status of a part in areas such as engineering, manufacturing and technical data. [Ref. 38: p. 56-102]

Over 80 percent of Navy managed items are coded for other than competitive procurement. Breakout reviews represent one opportunity to revise the AMC on existing replenishment parts. Another is the AMC conferences, where Navy and contractor engineers/logisticians review spares manufacturing, quality control, and data requirements to determine if competitive procurement is possible. [Ref. 39: p. 13]

The Navy's Breakout Program has been very successful since its inception in 1983. A four year phased program seeks an annual full screen breakout review of approximately 23,000 line items as a steady state by fiscal year 1987. Of the 17,265 reviews conducted during fiscal year 1986, 7,023 line items were broken out to either competition or the actual manufacturer for a 41 percent success rate. The Annual Buy Value was \$41 million and \$577 million for actual manufacturer and competition respectively. The total cost

avoidance attributed to the Navy breakout Program in fiscal year 1986 has been \$212.7 million. [Ref. 39]

The overall success of competition initiatives like the Breakout Program has caused DoD concern with the warranty requirement ever since the original amendment was introduced. [Ref. 19] Of major concern is the possible impact of the requirement for pedigreed parts. [Ref. 19] If a major weapon system is under some type of warranty, this would, in certain instances, preclude the option for component breakout. Part failures that breach the warranty agreement would be repaired or replaced under the contractual remedy provided for in the contract. This would appear to be a direct benefit of the warranty agreement and provide DoD with measurable cost avoidance. [Ref. 13: p. 24]

Significant problems may occur when the Government has voided the warranty on a particular component or part. For example, a contractor-sealed unit may be opened by fleet maintenance personnel to effect emergency repairs when a spare is not readily available. In this situation the Government would be forced to fund the replacement part. In all probability, a breakout screen has not been accomplished as the system is still under warranty and the Government would be forced to go to the prime contractor for the spare.

An additional problem occurs in the case of dual sourcing. Systems will be introduced into the fleet from

two or more different prime contractors. In many cases, each prime will be utilizing different subcontractors for component parts. Can different spares be used without voiding a system warranty?

Separate warranties can be obtained for all the spares introduced into the inventory. However, this practice may have no direct bearing on protecting the system warranty as required by the DFARS. Warranty agreements can be obtained that will protect the Government's rights to use different spares in a specific system. This may be a feasible solution in a leader-follower arrangement where there is a great deal of communication between the two prime contractors. Yet, in this researcher's opinion, this contractually mandated right to utilize any spare component or part in a warranted system may be very costly and not in the Government's best interest.

E. PROPOSED NAVAL AIR SYSTEMS COMMAND WARRANTY STRATEGY FOR SELECTED COMPONENTS

The Naval Air Systems Command (NAVAIR) is currently considering implementing an acquisition strategy that encompasses the spares warranty concept. [Ref. 40] The strategy embraces the acquisition techniques of:

- split award
- no-maintenance philosophy
- warranty provisions
- equipment salvage value

Currently being utilized for electrical equipment (AIR-536), it involves the NAVAIR procurement of certain components with specific warranty clauses. ASO would continue use of these warranty provisions for all future spares procurements. The basic concept centers around a new category of secondary item which is classified as a "rebuildable" rather than a "repairable". The Navy would not attempt repair of these rebuildables but rather return the failed units to the manufacturer for replacement or rebate.

Under the strategy, the contractor would agree to specific contractual clauses for first failure rebuildables, subsequent failure and Navy induced failure. A detailed warranty clause interpretation is as follows: [Ref. 40]

Under the provision of the warranty, the Navy would return the warrantied rebuildables to the contractor whenever a failure was noted. Each rebuildable would have a contractor affixed nameplate which identifies a rebuildable's serial number and its warranty expiration date. Upon receipt of a returned rebuildable the contractor would first determine whether it was/was not inoperable. Operable units would be returned to the Navy. (When an operable unit is returned to the Navy, the contractor will bill the Navy for the test and inspect cost.) Then, for inoperable units, under the observation of a Defense Contract Administration Services representative, the contractor would reach a determination as to whether the failure was or was not Navy induced. The inoperable rebuildable would be categorized as a first failure or a subsequent failure. Based on these determinations, the contractor would determine the extent of warranty which existed based on the Navy's reported failure date. Given the above determinations, the contractor would be liable to provide specific actions as discussed below.

A. First Failure - Not Navy Induced. The "first failure" category refers to the first reported failure of a rebuildable which had been purchased at full cost or which had been provided as a free replacement for a rebuildable which met the first failure criteria. If it was determined that the returned rebuildable was a first failure and that the failure was not Navy induced, the contractor would take the following actions:

1. If the failure occurred within the first 12 months since the contractor had sold the rebuildable to the Navy, the contractor would provide the Navy with a free replacement rebuildable. It is understood that the free replacement [spare] would carry a brand new item warranty (as if it had just been purchased at full procurement cost).
2. If the failure occurred between the 13th and 66th month, the contractor would issue a 70 percent discount coupon to the Navy and provide a check which constitutes a wear rebate. The 70 percent discount coupon can be used by the Navy for procurement or rebuild of an identical unit any time within the next five years. The wear rebate would be based on the price which the Navy paid for that particular rebuildable (when originally purchased) times a sliding factor of $1 - \left[\frac{\text{\# months elapsed since warranty data} - 12}{66 \text{ months} - 12} \right]$. Thus the wear rebate would be approximately 98 percent of previously paid procurement cost for 13th month returns and 2 percent for 66th month returns. (For example, if the returned inoperable rebuildable had been an outright purchase 13 months ago, the contractor would provide a wear rebate of 98 percent of the purchase price for that rebuildable.) While the Navy would relinquish its ownership of the failed unit when it was determined to be inoperable by the contractor, the Navy has an option to request the contractor to rebuild or replace the inoperable rebuildable at any time during the ensuing 12 months at a negotiated rebuild cost. The rebuild/replaced rebuildable would be re-warrantied for 66 months (under the "subsequent failure" category).
3. If the failure occurred between the 67th month and 10½ years, the contractor would provide a 70 percent discount coupon (as discussed above). While the Navy would relinquish its ownership of the failed unit when it was determined to be inoperable by the contractor, the Navy has an option to request the

contractor to rebuild or replace the inoperable rebuildable at any time during the ensuing 12 months at a negotiated rebuild cost. The rebuilt/replaced rebuildable would be re-warrantied for 66 months (under the "subsequent failure" category).

4. If the failure occurred at 10½ years, the contractor would not provide a 70 percent discount coupon. While the Navy would relinquish its ownership of the failed unit when it was determined to be inoperable by the contractor, the Navy has an option to request the contractor to rebuild or replace the inoperable rebuildable at any time during the ensuing 12 months at a negotiated rebuild cost. The rebuild/replaced rebuildable would be re-warrantied for 66 months (under the "subsequent failure" category).

B. Subsequent Failure - Not Navy Induced. If upon receipt of a failed rebuildable it is determined that the inoperable rebuildable's failure was not Navy induced, and it meets one of the following criteria, it is categorized as a "Subsequent Failure". The criteria are (1) that the unit had already been rebuilt or rebuilt/replaced for the Navy or (2) that the inoperable unit had been purchased with a 70 percent coupon.

1. If subsequent failure occurs within 66 months of the contractor's shipment of last rebuild or replacement, the contractor will provide the Navy with either a free replacement or a wear rebate--free replacement for rebuildables returned between the 13th and 66th months since the last contractor shipment. As discussed above in paragraph A2, the wear rebate is based on the duration of time since shipment of the last rebuild or replacement. The rebate formula (as discussed above in paragraph A2) is applied to the previous applicable price actually paid (less the 70 percent discount if a coupon had been employed) for the rebuild/replacement. (For example, if we assume a failure in the 13th month, the wear rebate formula would call for a 98 percent rebate of the price actually paid for that rebuild/replacement. If the returned inoperable rebuildable had been rebuilt or a rebuild/replacement 66 months ago, the wear rebate would be 2 percent of the rebuild cost which the Navy actually paid for that transaction.) As discussed in paragraphs A2, A3 and A4, while the Navy would relinquish its ownership of the failed unit when it was determined to be inoperable by the contractor,

the Navy has an option to request the contractor to rebuild or replace the inoperable rebuildable at any time during the ensuing 12 months at a negotiated rebuild cost. The rebuilt/replaced rebuildable would be re-warrantied for 66 months (under the "subsequent failure" category).

2. If the subsequent failure does not occur within 66 months of the contractor's shipment of previous rebuild or replacement, the contractor will not provide a wear rebate. While the Navy would relinquish its ownership of the failed unit when it was determined to be inoperable by the contractor, the Navy has an option to request the contractor to rebuild or replace the inoperable rebuildable at any time during the ensuing 12 months at a negotiated rebuild cost. The rebuilt/replaced rebuildable would be re-warrantied for 66 months (under the "subsequent failure" category)

C. Navy Induced Failure. If upon receipt, the contractor and Defense Contract Administration Services representative determine that the rebuildable's inoperability was Navy induced, no warranty applies. While the Navy would relinquish its ownership of the failed unit when it was determined to be inoperable by the contractor, the Navy has an option to request the contractor to rebuild or replace the inoperable rebuildable at any time during the ensuing 12 months at a negotiated rebuild cost. The rebuilt/replaced rebuildable would be re-warrantied for 66 months (under the "subsequent failure" category).

To a number of interviewees, the implications of this ambitious strategy are widespread. The major concern involves the implementation of the warranty. One of the clauses would provide for the issuance of discount coupons to the Navy under certain conditions. NAVAIR would have to identify a specific recipient for these coupons and establish procedures for their control and use. If the coupon is not used for a procurement or rebuild within the five years after issue, the coupons are worthless.

Another concern is the control of the "wear rebate" checks issued by the contractor payable to the Treasurer of the United States. Considering the duration of the proposed warranty, it is a major problem to identify the appropriation to which these rebates should be credited. Depending on whether the acquisition was made by NAVAIR or ASO, the financing appropriation could be either Aviation Procurement, Navy or the Navy Stock Fund. The deposit of a wear rebate to a specific appropriation could allow the recycling of that account's obligational authority. A recently released GAO report, titled "Defense Accounting Adjustments for Stock Fund Obligations Are Illegal," emphasizes the need for DoD to clearly follow established stock fund accounting procedures as outlined in 31 U.S.C. 1501. [Ref. 41]

Whenever the Navy returns an inoperable rebuildable to the contractor, a determination could be made that the failure was Navy induced. If such a determination is made, the warranty clauses concerning 70 percent coupons and wear relates are void. If the contractor determines that a returned repairable is operable, the contractor returns the rebuildable to the Navy with no interruption of that particular rebuildable's warranty clock. Since the warranty deals exclusively in dates, the Navy can hold a given rebuildable in stock throughout the entire duration period.

Also, it is questionable who is the final determination authority for operability.

In addition to the specific warranty coverage, the no-maintenance philosophy of the acquisition strategy has some proven benefits. Studies performed by NAVAIR have shown a marked increase in reliability for those components that do not undergo any form of intermediate or organic maintenance. [Ref. 40] However, it is the researcher's opinion that this concept cannot be universally adopted without significant changes to the Navy's logistic system. Many components lend very well to this philosophy while fleet storage constraints and forward-deployed maintenance strategies do not allow for 100 percent contractor maintenance.

F. NAVAL SUPPLY SYSTEMS COMMAND WARRANTY POLICY

Currently the Naval Supply Systems Command (NAVSUP) has no definitized warranty policy. Of primary concern is the need to define NAVSUP's role in the entire warranty process. Lack of clear guidance from the Assistant Secretary of the Navy's (ASN) office has left each of the systems commands to pursue their own warranty initiatives with little thought to implementation and enforcement. [Ref. 10: p. 57-58] NAVSUP is not specifically tasked under the statute and the DFARS requirements. In the classic sense, NAVSUP does not procure weapon systems but rather spare assemblies, components, and repair parts. As such, it has been NAVSUP policy that the

hardware systems commands advise NAVSUP of its responsibilities to meet the requirements of the system warranties. [Ref. 42]

NAVSUP has established a Warranty Policy Committee to oversee the development of a warranty policy instruction. Formerly chaired by the spares competition and Logistics Technology Program Office (PML550), it is now headed by the Fleet Support, Corporate Plans, and Logistics Division (SUP-03). The instruction is still being formalized with no expected release date as of this writing. As of March 1987, the following issues are addressed in the draft: [Refs. 10, 43]

- Definition of NAVSUP, Hardware Systems Command (HSC), ICP, and field level responsibilities in warranty development and implementation.
- Establishment of a Warranty Manager at NAVSUP, ICP's and Naval Supply Center's (NSC).
- Emphasis on coordination with HSCs in maintaining warranty requirements on equipment supported by the ICPs.
- Establishment of warranty acquisition and administrative procedures by ICPs.
- Direction to the HSCs to issue policy guidance on warranty data collection and reporting.
- Direction to the ICPs to perform data collection and reporting in consonance with HSC objectives.
- Implementation procedures including administration, warranty assessment and refunds and training.

There has been much feedback from the directorates within NAVSUP that will be impacted by the proposed warranty policy. Many of the concerns deal with issues that have to be addressed within the contract and may be outside the scope of the instruction. For example:

- How will the user know the item is warranted?
- Is organizational or intermediate repair authorized?
- How are requirements determinations addressed?

Other concerns with the draft instruction are crucial to structuring a workable administration system and should be addressed. For example:

- The responsibilities for data collection are unclear. Will each ICP design their own formats as per their respective HSCs?
- The role of the Defense Contract Administration Services (DCAS) offices needs to be further defined. While warranty administration is within their purview, DCAS responsibilities need to be spelled out. [Ref. 23: p. 42:302(38)]
- The requirements of the fleet user need to be further defined. If the existing Quality Deficiency Report (QDR) system is to be used, specific distribution instructions will be needed.

The establishment of a centralized data base to track warranty information is imperative in this researcher's view. In addition to performing cost-effectiveness analyses on future warranties, NAVSUP has a direct concern in the tracking of its inventories. Just as the mismanagement of Depot Level Repairables has a potential negative impact on the Navy Stock Fund, so will the mismanagement of warranted

items. The readiness of the fleet will depend upon the myriad of warranted items being correctly shipped, tracked, repaired or replaced, and put back in inventory. Failure to do so can severely affect the supply system's inventory models.

G. OTHER SPARE PARTS WARRANTY INITIATIVES

1. Aviation Supply Office

Aside from the NAVSUP warranty issues, the Navy Aviation Supply Office (ASO) has been utilizing warranties on spares procurements for some time. "Standard Supply" warranties as contained in the FAR are generally used for all non-weapon system procurements except when found not to be cost-effective on a case-by-case basis. [Ref. 23: p. 52.246] Specific factors outlined for using the warranty include: [Ref. 44: p. 1]

- Nature of the Item -- Consideration should be given to the complexity and function of the item, the degree of development of the item, the difficulty in detecting defects in the item prior to acceptance, and the potential harm to the Government if the item were defective.
- Cost -- The benefits to be derived from the warranty must be related to the cost of the warranty to the Government.
- Administration -- As a general rule, there must be some assurance that an adequate administrative reporting system for defective items exists.

The ASO Purchasing Division instruction was issued on 29 September 1982, prior to the current warranty

legislation. However, in the researcher's opinion it is still a valid and useful policy for spare parts warranties that do not come under the current statutory requirements.

2. Navy Ships Parts Control Center

The Navy Ships Parts Control Center (SPCC) has little or no warranty experience or definitive policy. [Ref. 42] SPCC generally does not require warranties for spares procurement because SPCC believes they are inherently cost-ineffective. Warranties are rarely used for low-dollar consumable spares or replenishment items.

3. Air Force Logistics Command

As previously discussed, the Air Force has extensive experience in the development and use of warranties. The Product Performance Agreement Center (PPAC) has been tasked with collecting warranties and monitoring a range of quality and performance incentives to improve reliability and performance of subsystems, commodities, and parts. [Ref. 42] The Air Force policy has long been to actively pursue warranties within existing procedures if they are cost effective.

Consistent with the policy that warranties should utilize current procedures as much as possible, the Air Force has issued the following warranty constraints: [Ref. 36]

- The lowest level of hardware subject to warranty requiring contractor corrective action should be that

which can be effectively marked using MIL-STD-130 procedures.

- To the extent possible, warranty duration should be stated as a fixed calendar date and be no longer than that required to identify defects.
- Parameters selected for warranty coverage must be measurable, and the method of measurement must be included in the warranty clause.
- Failure analyses and associated reports should be required for all items returned for correction to provide engineering feedback.
- Generic clauses, tailored to meet specific requirements, should be used to the extent possible, with each procuring activity developing such clauses in coordination with warranty administrative offices.

The Air Force has recently instituted a pilot study at its San Antonio, Texas, Air Logistics Center (ALC) regarding spare parts warranties. [Ref. 45] In an effort to achieve the benefits of the warranty provision without severely impacting the acquisition process, all spare parts procurements contain "boilerplate" warranty provisions. The warranty covers defects in materials and workmanship and is substantially the same clause as contained in the FAR. [Ref. 23: p. 52.246-17 and 52.246-18] The duration of the coverage is for one year after acceptance by the Government and does not vary. Additionally, the agreement provides for the following remedies: [Ref. 45]

At the Government's option, supplies may be either (i) returned to the contractor for correction or replacement, or (ii) corrected by the contractor at the Government site within CONUS [continental U.S.], or (iii) corrected by the Government with an equitable adjustment of contract price. . . . The contractor shall promptly comply with a written

notice from the Contracting Officer to correct or replace the defective item without additional charge to the Government. Any disagreement concerning the contractor's liability for the defect shall not delay the contractor's correction of the defect. If it is later determined that the defect is not subject to the warranty, the contractor shall be equitably compensated. . . . Any items replaced or repaired shall be subject to the same warranty as newly delivered items.

While the warranty provisions are fairly standard for the level of procurement, the Air Force has not paid any additional direct funding for the agreement. The study centers around whether or not there is any perceived implicit price increase in the contracts that can be attributed to the "take it or leave it" agreement. The study began in November 1986 and as of 1 June 1987 there has been no price increase that can be attributed to the warranty. The study has yet to be released and whether or not it will focus on any quality improvements in the spares is not known.

H. CHAPTER SUMMARY

This chapter summarizes some of the major issues that pertain to developing and implementing the spare parts warranty. Similarities and differences between the major weapon warranty requirements that face the hardware systems commands and the spares warranty issue facing the Navy Field Contracting System were discussed. The chapter concluded with an overview of some of the initiatives underway in NAVSUP, ASO, SPCC and the Air Force to apply the spares warranty in consonance with weapon system warranty efforts.

IV. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The objectives of this research were as follows: to identify and discuss the background of current warranty policy, to investigate efforts underway in the Navy to implement the warranty requirement, to investigate current warranty policy and procedures as they relate to the acquisition of spare parts, to enumerate the major issues concerning the relationship of spare parts warranties and major system warranties, and to discuss the spare parts warranty issue as it relates to the Navy Supply Systems Command (NAVSUP) competition initiatives. In accomplishing this, several conclusions were reached.

Conclusion #1 -- The use of express warranty provisions in all Navy acquisition contracts can lead to tangible benefits if properly developed and implemented. These benefits include lower life cycle costs, improved tracking and evaluation of field performance, the contractor's assumption of risk for equipment reliability during the warranty duration and improved equipment quality. However, the realization of these benefits is directly dependent upon a conscientious approach to warranty development and subsequent implementation.

Conclusion #2 -- A properly developed warranty must be tailored to the specific acquisition. The development of the warranty is an integral part of the acquisition strategy. As many systematic, operational, and acquisition factors shape the acquisition strategy development, these same factors influence the warranty. These factors include budgetary considerations, Integrated Logistic Support levels, interdependence on other programs, system specifications and the adopted maintenance philosophy. Also the developed warranty must be administrable.

Conclusion #3 -- Warranty benefits cannot accrue unless the warranty is properly implemented. Regardless of the level of effort expended on warranty development, the provisions of the warranty must be able to be carried out. No warranty will be cost-effective unless it is properly used. At the very least a system must be established to identify warranted items, ship failed equipments, if necessary, back to the contractor and return these units to the Navy inventory. Failure to utilize the contractual remedies of the warranty will be very costly and has the potential to invite adverse Congressional scrutiny of the Navy's compliance with the warranty statute.

Conclusion #4 -- The Navy has no definitive policy on developing and administering the warranty. Despite the fact that the warranty statute is almost three years old, the

Navy has yet to publish warranty guidelines on development and implementation. While the Army and the Air Force have comprehensive instructions or directives explicitly dealing with warranties, the Navy has left each major buying command to implement their own management policies. The impact on warranty development is minimal. Each command has differing requirements that directly affect the development of the contractual provisions. However, the lack of a consentaneous approach to warranty administration will heavily burden the fleet user with differing requirements that may become unmanageable and therefore unenforceable.

Conclusion #5 -- The Air Force Product Performance Agreement Center (PPAC) has the available assets to greatly assist the Navy in warranty management. The PPAC Decision Support System is an excellent vehicle for developing the warranty provisions specific to the applicable acquisition. Currently the Navy has no comparable system and should take advantage of the resource accorded through the recently signed Memorandum of Agreement regarding its use. It may be more cost-effective in the long run to provide support funding to PPAC than to develop a similar system in each Service.

Conclusion #6 -- The wholesale duplication of warranty efforts for major weapon systems cannot be applied to spare parts procurements. The statute currently requires a

written Essential Performance Warranty for weapon systems and mandates the use of a waiver when it is not included in the contract. There are no such requirements for the bulk of spare parts procured by the Navy Field Contracting System (NGCS). Additionally, the entire acquisition process and environment is completely different. The Navy hardware systems commands have the level of technical expertise available to apply the warranty provisions to meet specific objectives. They are obviously aware of the degree of complexity of the system and have developed a comprehensive acquisition strategy that integrates the warranty plan. The NFCS primarily buys spares for system inventories and to meet immediate operational requirements. Essential Performance Warranties may not be cost effective for small, repetitive buys and may be impossible to apply to most repair parts.

Conclusion #7 -- The system level warranty has a great impact in the subsequent spares warranty development. The provisions contained in the weapon system contract can directly affect what type of warranty coverage is necessary for the spares procurements. For example, if a provision states that the use of spare parts from other than the original manufacturer will void the system warranty, then this must be communicated to the NFCS. Also, specific remedies for the system components should be duplicated in

the spares contracts to ensure the warranty implementation is correctly carried out. Similar, if not identical, implementing provisions will help to ensure warranty enforcement in the fleet.

Conclusion #8 -- Development of warranty contractual provisions is the same for weapon system and spares warranties. Regardless of the level of warranty coverage, the Government must ensure that its rights and responsibilities are clearly delineated in the procurement contract. As a minimum every warranty plan should address the following:

- Precedence of the warranty over inspection/acceptance
- Equipment identification
- Specific warranty coverage or controls
- Conformance Determination
- Remedies
- Transportation
- Date and Reports
- Markings and/or seals
- Notification

Conclusion #9 -- Current cost-benefit analysis models do not adequately address the indirect costs of the warranty. In addition to the explicit cost of warranty coverage, the cost to administer should be considered. This is particularly true for spare parts warranties where there is

no statutory requirement to pursue them. In many cases, the individual cost of the repair part can be greatly exceeded by the Navy's cost to enforce the warranty. While tracking and shipping procedures must be in place for the implementation of all warranties, the added burden of collecting data and contract administration for the bulk of small, inexpensive repair parts procured by the NFCS can become overwhelming to fleet user and warranty managers. These costs are very difficult to measure but may be considered on aggregate to set a threshold price level for warranty pursuit for spare parts.

Conclusion #10 -- The long delay in Navy guidance on data collection procedures will hamper warranty initiatives. Data collection and dissemination is paramount to gauging the effectiveness of warranties. While the General Accounting Office has found the Navy to be complying with the statutory warranty requirements, there is no conclusive evidence the Navy as been reaping the benefit of the added warranty costs. Before undertaking the additional task of applying the warranty to all procurements, the Navy should have a system in place to appraise the enforcement and cost-effectiveness of its efforts.

Conclusion #11 -- NAVSUP Competitive initiatives, particularly the Breakout program, should continue in consonance with the warranty. The statute requires that all

efforts must be made to protect the weapon system warranty. Unless specific contract provisions state that use of differing spares will void a system warranty, NAVSUP can continue to breakout the applicable spares if it is deemed cost effective. In those cases where the contractual remedy will provide for contractor repair or replacement, the Navy should adjust its inventory model accordingly to account for the warranty duration period. As technical breakout involves decisions made in consonance with the hardware systems commands, especially in the case of the Navy Ships Parts Control Center (SPCC) and the Naval Sea Systems Command (NAVSEA), the level to which spares are broken out and the ultimate impact on the system warranty can be fully evaluated together to ensure the best quality for the least cost.

Conclusion #12 -- The NFCS field activities particularly Ships Parts Control Center (SPCC) and the Navy Aviation Supply Office (ASO), cannot drive warranty policy initiatives. Decisions made at the hardware systems command level ultimately drive warranty decisions made by the NFCS. In compliance with the statute, SPCC and ASO must ensure that the system warranty is not invalidated. Additionally, major policy initiatives regarding warranty implementation should apply to all Navy commands. It would

be extremely difficult to administer and enforce the warranty if there is no central coordination.

Conclusion #13 -- Warranties on spare parts should remain as simplistic as possible until sufficient data are available to determine cost-effectiveness. Given the embryonic state of the Navy's warranty administration policies, it is in the best interest of the Service to establish a workable system to fully implement the requirements of the statute and the DFARS. Once this is accomplished, the Navy can phase in more advanced warranty initiatives for spare parts. As discussed, these are many administration factors that are particular to the spares warranty. Establishing a basis for further expansion of the administration system will probably be more cost-effective in the long run.

B. RECOMMENDATIONS

The following are recommendations by the researcher as of the result of this study.

Recommendation #1 -- The Navy Supply Systems Command (NAVSUP) should implement procedures that cover warranty administration. NAVSUP's mission regarding supply transportation, logistic support, and management of the Navy Stock Fund will require that the bulk of warranty administration heavily involve the Navy Supply System. As such, NAVSUP should take the initiative to implement policy

that all NFCS buying commands must follow to assure administration of any developed warranty agreement. NAVSUP should take steps to ensure that they do not end up writing policy to conform to the initiatives of the hardware systems commands (HSC) but rather ensure that the initiatives of the HSCs meet the NAVSUP administrative policies.

Recommendation #2 -- NAVSUP should expand its warranty policy committee to take advantage of field expertise and to ensure rapid resolution of the warranty administration issues. The Warranty Policy Committee should include representatives of the HSCs, ASO and SPCC, as well as in-house Technical, Legal, Stock Fund, and Contracting directorates in addition to the current members. In view of the three year old statutory requirement for warranties, a workable administration system should be implemented as soon as possible.

Recommendation #3 -- The Navy hardware systems commands (HSC) should drive warranty development initiatives for ASO and SPCC. Spare parts warranties must take into consideration the weapon systems warranties that they support. This is particularly true in view of the statutory requirement that spares warranties do not invalidate systems warranties. As such, any special warranty requirements for spares should emanate from the HSCs.

Recommendation #4 -- NAVSUP should require the Navy Field Contracting System to utilize a standard Materials and Workmanship Warranty for all spares buys. The warranty should be applied on a no-cost basis not superseded by a higher requirement from the HSC. Use of the no-cost provision has been very successful at the San Antonio Air Logistics Center (SA-ALC) and after nine months has shown no attributable cost increase in their spares buys. The benefits of this type of coverage has been discussed and its across-the-board use will bring the Navy more in line with the other Services. NAVSUP should incorporate the provisions of the SA-ALC warranty into the ASO warranty instruction for policy implementation (ASO PGINST 4275.ID).

Recommendation #5 -- The NAVSUP competition initiative should continue in consonance with current warranty initiatives. Insufficient data are available to ascertain the full affect of the warranty on the breakout program. However, under the guidance of the Competition Advocates and warranty managers, a determination should be made during the initial development phase of the acquisition strategy to utilize each program as necessary to ensure the most cost-effective procurements. Provisions can be put into the system contract to ensure subsequent breakout if it is deemed cost effective. In those instances when it is in the Navy's best interest to protect the warranty for its

duration, the Navy could assign an Acquisition Method Suffix Code (AMSC) to reflect this (perhaps "W"). Spare parts warranties, unlike weapon system warranties will have minimum affect on the breakout program as long as an effective communication system is established to alert competition and breakout personnel of special warranty requirements that obviate breakout.

Recommendation #6 -- The Navy should implement a fleet warranty training and enforcement program as soon as possible. Consequent to any policy initiatives regarding warranty development and implementation, is to ensure that warranties are being applied at the user level. The most conscientious approach to warranty development is ultimately useless if fleet personnel discard warranted items during the warranty period. Fleet-wide training is a lengthy process and must include both maintenance and supply personnel to be effective. NAVSUP should take the initiative to begin this training and subsequent enforcement as soon as possible to meet the requirements of warranted equipment being placed in inventory. This can best be accomplished through the appropriate Readiness Support Groups and Type Commanders.

Recommendation #7 -- NAVSUP should establish warranty managers at each of the NFCS commands as well as Ad Hoc Warranty Review Groups to evaluate warranties and their

ultimate enforcement. There is a decided difference in the level of expertise regarding warranties throughout the NFCS. Much of this expertise rests with ASO while SPCC has little or no experience with wholesale use of the warranty. An established warranty manager at each command would ensure that policy initiatives are being uniformly carried out and assist the training in warranty development and implementation. The Ad Hoc Warranty Review Groups can ensure the necessary warranty coverage is provided in the contract as well as provide for the dissemination of useful "lessons-learned: data and information to item managers.

C. ADDRESSING THE RESEARCH QUESTIONS

The primary research question was as follows:

What are the principal problems regarding the application of the warranty provisions to the acquisition of spare parts and how might these problems be resolved?

The problems involved in developing and implementing spare parts warranties center around the nature of the procurements and the difficulty in administering them. Spare parts warranties are driven by the requirements of the system warranty. As required by the statute, the Navy Field Contracting System (NFCS) must ensure that the system warranty is not voided. As such, the development of the contractual provisions by the Hardware Systems Commands (HSC) must account for subsequent procurements of spares. Current policy does not require spares warranties and the

NFCS has little experience with them (with the possible exception of the Navy Aviation Supply Office (ASO)). It is therefore problematic to begin to employ complex warranty agreements for all spares buys.

Additionally, the Navy has yet to fully develop a warranty administration system. It must first address meeting the statutory requirements of warranty implementation before it tackles the added complexities of the spares issues. For example, the sheer bulk of the Navy spares inventory, marking requirements and stowage and issue considerations make spares warranties a difficult task.

Until such time as the NFCS becomes familiar with warranty use and the administration system is sophisticated enough to handle the enormous volume of spare parts, the Navy should implement simple warranty requirements to protect itself against latent defects. This would be a standard Materials and Workmanship Warranty for a standard calendar duration. The use of more complex requirements should be dictated by the appropriate program office in the Hardware System Command.

Once the administration system is in place, the Navy should concentrate on fleet use in terms of training and enforcement control by the appropriate Readiness Support Groups and Type Commanders.

The subsidiary research questions were as follows:

1. What are the current warranty requirements and provisions for spare parts procurements?

Current policy does not require warranties for acquisitions of other than major systems. This would include the level of most procurements made by the NFCS. However, the benefits of the warranty can apply to all Government procurements and each must be evaluated in terms of cost-effectiveness. The same structuring of provisions for major weapon systems apply to spare parts. The developer must ensure the Government's rights and obligations under any warranty agreement are clearly stipulated in the contract.

2. What problems have been and could be encountered in applying the use of warranties to spare parts procurements?

The Navy has little experience in applying the warranty to spare parts. ASO is in the forefront in including a Materials and Workmanship Warranty in the majority of its contracts. While this has been found to be a sound practice, little or no data have been collected on the overall effectiveness of the warranty. It is extremely doubtful that it has been universally enforced and, as such, may not be cost-effective in all cases. Without the benefit of a centralized data collection system, it is impossible

to evaluate the application of more complex warranty forms to spares procurements.

Additional problems may be encountered unless effective communication is maintained between the HSCs and the NFCS. Special warranty requirements must be known to the appropriate item managers.

The area of major concern rests with implementation. Warranties must be used to be effective. An administration system must be carefully developed to encompass the vast numbers of spare parts in inventory and also be simplistic enough to be practically enforceable at the fleet level.

3. Under what circumstances would the warranty requirement be waived?

Spare part warranties are exempt from the statutory requirements and, as such, not subject to the waiver process. Individual warranty teams at each command within the NFCS should evaluate exceptions to the standard provisions on a case-by-case basis when it is deemed not to be cost-effective.

4. What problems involved in the administration of warranties must be recognized in the development and use of warranty clauses?

Regardless of the level of the procurement, every contract should clearly address the following provisions in the warranty plan:

- Precedence of the Warranty over Inspection/Acceptance
- Equipment identification
- Specific Warranty coverage or controls
- Duration
- Conformance Determination
- Remedies
- Transportation
- Data and Reports
- Markings and/or Seals
- Notification

The selection and use of each provision directly affects subsequent implementation. For example, the type or level of warranty control will affect the type of usage data that must be collected. A MTBF guarantee requires more complex enforcement than materials and workmanship coverage. Additionally, the remedy required may either make exclusive use of the Navy transportation system or could entail detailed bill-back procedures. It is extremely important that the selected provisions can be effectively implemented.

5. What implications does the Navy Breakout Program have on the process of using warranties in spare parts procurements?

The Navy Breakout Program is most affected by major weapon systems warranties. Spares or components

that have been "broken out" and supplied as Government Furnished Equipment (GFE) may affect system programs unless the system contract allows for it. However, the use of separate warranties for those parts broken out, can go hand-in-hand with the Breakout program. When deemed cost effective, it is in the Navy's best interest to apply separate warranties to GFE whenever possible to ensure that the use of those spare parts do not become the "weak link" in the system warranty. Again, this emphasizes the necessity of the HSC program offices to clearly delineate specific spares warranty requirements.

What specific steps can be taken to address the problems encountered by the NFCS in resolving warranty issues and problems?

Initially, the Navy must fully explore the problems and define them as they relate to the acquisition and logistics processes. Specific steps include:

- Expansion of the NAVSUP Warranty Policy Committee to include such expertise as necessary to address the issues and implement definitive policy and guidance.
- Make better use of available resources on the warranty (e.g., the Product Performance Agreement Center and other Services).
- Establish a Navy-wide data collection system to ensure support to the NFCS. Separate initiatives by each of the HSCs will severely handicap the NFCS and ultimately NAVSUP in any implementation policy.

- Establish warranty managers at each of the NFCS commands as well as Ad Hoc Warranty Review Groups to review evaluate warranties and their ultimate enforcement.
- Provide training to NFCS personnel on warranty development and implementation.
- Establish training for warranty enforcement at the fleet level to ensure NFCS efforts are being implemented.

D. RECOMMENDATIONS FOR FUTURE STUDY

The following areas are identified for potential research:

1. What type of cost-benefit analysis could be adapted for use by the NFCS to evaluate the use of warranties for spare parts procurement?
2. Could the Air Force Product Performance Agreement Guide be adapted or expanded for use by the NFCS in spare parts procurements?
3. What type of administrative plan could be adapted by NAVSUP that will ultimately be enforceable at the fleet level?
4. What type of training will be necessary for (a) the NFCS, and (b) the fleet to implement the warranty Navy-wide?
5. What type of warranty management structure will be needed at NAVSUP and the NFCS to meet future challenges?
6. Is it possible to automate warranty administration utilizing existing hardware and software?

APPENDIX A: LIST OF INTERVIEWEES

The following is a list of people who were either interviewed or directly provided information necessary for this research.

A. Office of the Assistant Secretary of the Navy (Shipbuilding and Logistics)

1. Morris, W. R., CAPT, SC, USN, Deputy Director Contracts and Business Management, 17 March 1987.
2. Yaffee, M., Office of Contracts and Business Management (CBM-CM), 27 March 1987.

B. Naval Supply Systems Command

1. Genovese, J., Director Spares Completion and Logistic Technology Program Office (PML550), 26 March 1987.
2. Quigley, R. M., CDR, SC, USN, Spares Competition and Logistic Technology Program Office, 26 March 1987.
3. Keller, F., CDR, SC, USN, Spares Competition and Logistic Technology Program Office, 26 March 1987.
4. Fisher, A., Spares Competition and Logistic Technology Program Office, 26 March 1987.
5. Nusbaum, M., Logistics Plans and Policy Control Division, (SUP-03Q), 27 March 1987.
6. O'Brien, H., Logistics Plans and Policy Control Division, (SUP-03Q), 27 March 1987.
7. Johnson, E., Financial Management/Comptroller Division, (SUP-013), 27 March 1987.
8. Campbell, W., Spares Competition and Logistics Technology Office (PML550), 26 May 1987.
9. Angelone, J. P., Spares Competition and Logistic Technology Office (PML550), 26 March 1987.

10. Rose, A., Spares Competition and Logistic Technology Office (PML550), 26 March 1987.

C. Naval Air Systems Command

1. Nielsen, G., CDR, SC, USN, BFM H-53/H-46 Helicopters Program Office, 26 May 1987.
2. Delaurentis, M., CDR, SC, USN, BFM Propulsion and Power Division, (AIR-536D), 27 March 1987.
3. Klein, L., Propulsion and Power Division, (AIR-53633), 27 March 1987.

D. Joint Cruise Missile Project Office

1. Nicklas, J. G., LTCOL, USAF, Program Manager, Ship System Production and fleet Engineering Support Division (PMA-2823), 6 April 1987.

E. Aviation Supply Office

1. Wilsker, O., Acquisition Plans and Policy Office, Contracts Division, 30 March 1987.

F. Ships Parts Control Center

1. Parker, J., Technical Breakout Department (SPCC-05622), 31 March 1987.

G. Air Force

1. Cunningham, W., MAJ, USAF, Officer-in-Charge, Product Performance Agreement Center, Wright-Patterson AFB, Dayton, OH, 20 February 1987.
2. Sidorski, A., Air Force Logistics Command, Wright-Patterson AFB, (AFLC-AMPL), 20 February 1987.

H. Naval Underwater Systems Command

1. Thomas, L., Contracts Legal Division, 16 February 1987.

I. Defense Contractors

1. Paddock, J., Program Manager, Undersea Systems, General Electric Corp., Syracuse, New York, 21 May 1987.
2. George, B., Technical Division, GTE Corp., Sunnyvale, California, 17 April 1987.
3. Stone, M., Contacts Branch, ARGOSystems Corp., Sunnyvale, California, 17 April 1987.

APPENDIX B: GLOSSARY OF TERMS

Acceptance - the act of an authorized representative of the Government by which the Government, for itself or an agent of another, assumes ownership of existing identified supplies tendered or approves specific services rendered as partial or complete performance of the contract. [Ref. 1: p. A-1]

Availability Guarantee - a contractual guarantee that the availability of operational systems will meet a stated level when measured in accordance with stipulated procedures.

Commercial Supplies - equipment or supplies that normally are sold or offered to the public commercially by a supplier (frequently referred to as off-the-shelf items).

Correction - elimination of a defect.

Cost-Benefit Analysis - the process used to compare the total costs of a warranty with the benefits to be derived from the warranty.

Defect - any condition or characteristic in any supplies or services furnished by the contractor under the contract that is not in compliance with the requirements of the contract.

Foreign Military Sales - the selling of United States-produced military equipment and services to friendly foreign governments under the authority of the Foreign Assistance Act of 1961, as amended.

Government-Furnished Property - property in the possession of, or acquired directly by, the Government and subsequently delivered or other wise made available to the contractor.

Initial Production Quantity - the number of units of a weapon systems contracted for in the first program year of full-scale production. [Ref. 4: p. 46.7-3]

Inspection - examination and testing of supplies or services (including, when appropriate, raw materials, components, and intermediate assemblies) to determine whether they conform to contract requirements.

Latent Defect - a defect that exists at time of acceptance that is not normally detected through routine inspection and that manifests itself after acceptance.

Life-Cycle Cost - the total cost to the Government for acquiring, operating, and supporting a system over its lifetime.

Logistics Support Cost Guarantee - a contractual guarantee that the logistics support cost of a population of systems will not exceed a stated value when measured and calculated in accordance with stipulated procedures.

Mature Full-Scale Production - the follow-on production of a weapon system after manufacture of the lesser of the initial production quantity or one-tenth of the eventual total production quantity. [Ref. 4: p. 46.7-3]

Mean Time Between Failures Guarantee - a contractual guarantee that fielded or field-tested systems will exhibit a stated MTBF level when measured in accordance with stipulated procedures.

Prime Contractor - party that enters into an agreement directly with the United States to furnish a system or a major subsystem. [Ref. 4: p. 46.7-3]

Product Performance Agreement - a management tool designed to increase the contractor's responsibility for the field performance of a product.

Redesign Remedy - warranty remedy that requires the contractor to redesign the product to correct a deficiency.

Reliability - characteristic of a system or equipment that describes its ability to perform without failure. Reliability is usually expressed in terms of mean time between failures (MTBF) or probability of mission success.

Reliability Improvement Warranty - a fixed-price contractual commitment for a contractor to provide depot repair services as part of a long-term warranty, thereby providing an inherent incentive to correct problems and improve reliability.

Turnaround Time - the time from receipt of a warranted item at the contractor's repair facility to completion of the repair and sign-off by the authorized Government representative.

Warranty Administration - activities conducted to prepare for, implement, and terminate the warranty.

Warranty Breach - failure to meet the warranty terms and conditions.

Warranty Duration - the coverage period for the warranty; may be on an item, lot, or total production quantity basis.

Warranty Extension - continuation or modification of the warranty when the current warranty is about to expire.

Warranty Implementation Plan - a plan that defines warranty responsibilities, identifies responsible participants, and establishes warranty interface and implementation procedures.

Warranty Price - the price paid to the contractor for providing the warranty. In cases where a separate contractual line item for warranty does not exist, warranty price may have to be estimated.

Warranty Remedy - actions of a contractor to meet its obligations under the terms of the warranty when a warranty defect occurs.

Warranty Risk - risks associated with the warranty commitment.

Warranty Transition - events related to ending a warranty. Transition may entail a change in maintenance structure.

Warranty Waiver - a variance from meeting the requirements of 10 USC 2403 because of national security interests or because a warranty would not be cost-effective.

§ 2403. Major weapon systems: contractor guarantees

(a) In this section:

(1) "Weapon system" means items that can be used directly by the armed forces to carry out combat missions and that cost more than \$100,000 or for which the eventual total procurement cost is more than \$10,000,000. Such term does not include commercial items sold in substantial quantities to the general public.

(2) "Prime contractor" means a party that enters into an agreement directly with the United States to furnish part or all of a weapon system.

(3) "Design and manufacturing requirements" means structural and engineering plans and manufacturing particulars, including precise measurements, tolerances, materials, and finished product tests for the weapon system being produced.

(4) "Essential performance requirements", with respect to a weapon system, means the operating capabilities or maintenance and reliability characteristics of the system that are determined by the Secretary of Defense to be necessary for the system to fulfill the military requirement for which the system is designed.

(5) "Component" means any constituent element of a weapon system.

(6) "Mature full-scale production" means the manufacture of all units of a weapon system after the manufacture of the first one-tenth of the eventual total production or the initial production quantity of such system, whichever is less.

(7) "Initial production quantity" means the number of units of a weapon system contracted for in the first year of full-scale production.

(8) "Head of an agency" has the meaning given that term in section 2302 of this title.

(b) Except as otherwise provided in this section, the head of an agency may not after January 1, 1985, enter into a contract for the production of a weapon system unless each prime contractor for the system provides the United States with written guarantees that—

(1) the item provided under the contract will conform to the design and manufacturing requirements specifically delineated in the production contract (or in any amendment to that contract);

(2) the item provided under the contract, at the time it is delivered to the United States, will be free from all defects in materials and workmanship;

(3) the item provided under the contract will conform to the essential performance requirements of the item as specifically delineated in the production contract (or in any amendment to that contract); and

(4) if the item provided under the contract fails to meet the guarantee specified in clause (1), (2), or (3), the contractor will at the election of the Secretary of Defense or as otherwise provided in the contract—

(A) promptly take such corrective action as may be necessary to correct the failure at no additional cost to the United States; or

(B) pay costs reasonably incurred by the United States in taking such corrective action.

(c) The head of the agency concerned may not require guarantees under subsection (b) from a prime contractor for a weapon system, or for a component of a weapon system, that is furnished by the United States to the contractor.

(d) Subject to subsection (e)(1), the Secretary of Defense may waive part or all of subsection (b) in the case of a weapon system, or component of a weapon system, if the Secretary determines—

(1) that the waiver is necessary in the interest of national defense; or

(2) that a guarantee under that subsection would not be cost-effective.

The Secretary may not delegate authority under this subsection to any person who holds a position below the level of Assistant Secretary of Defense or Assistant Secretary of a military department.

(e)(1) Before making a waiver under subsection (d) with respect to a weapon system that is a major defense acquisition program for the purpose of section 189a of this title, the Secretary of Defense shall notify the Committees on Armed Services and on Appropriations of the Senate and House of Representatives in writing of his intention to waive any or all of the requirements of subsection (b) with respect to that system and shall include in the notice an explanation of the reasons for the waiver.

(2) Not later than February 1 of each year, the Secretary of Defense shall submit to the committees specified in paragraph (1) a report identifying each waiver made under subsection (d) during the preceding calendar year for a weapon system that is not a major defense acquisition program for the purpose of section 139a of this title and shall include in the report an explanation of the reasons for the waivers.

(f) The requirement for a guarantee under subsection (b)(3) applies only in the case of a contract for a weapon system that is in mature full-scale production. However, nothing in this section prohibits the head of the agency concerned from negotiating a guarantee similar to the guarantee described in that subsection for a weapon system not yet in mature full-scale production. When a contract for a weapon system not yet in mature full-scale production is not to include the full guarantee described in subsection (b)(3), the Secretary shall comply with the notice requirements of subsection (e).

(g) Nothing in this section prohibits the head of the agency concerned from—

(1) negotiating the specific details of a guarantee, including reasonable exclusions, limitations and time duration, so long as the negotiated guarantee is consistent with the general requirements of this section;

(2) requiring that components of a weapon system furnished by the United States to a contractor be properly installed so as not to invalidate any warranty or guarantee provided by the manufacturer of such component to the United States;

(3) reducing the price of any contract for a weapon system or other defense equipment to take account of any payment due from a contractor pursuant to subclause (B) of subsection (b)(4);

(4) in the case of a dual source procurement, exempting from the requirements of subsection (b)(3) an amount of production by the second source contractor equivalent to the first one-tenth of the eventual total production by the second source contractor; and

(5) using written guarantees to a greater extent than required by this section, including guarantees that exceed those in clauses (1), (2), and (3) of subsection (b) and guarantees that provide more comprehensive remedies than the remedies specified under clause (4) of that subsection.

(h)(1) The Secretary of Defense shall prescribe such regulations as may be necessary to carry out this section.

(2) This section does not apply to the Coast Guard or to the National Aeronautics and Space Administration.

(Added Pub.L. 98-525, Title XII, § 1234(a), Oct. 19, 1984, 98 Stat. 2601.)

Prior Provisions. Provisions similar to this section were contained in Pub.L. 98-212, Title VII, § 794, Dec. 8, 1983, 97 Stat. 1434 (set out as a note under section 2304 of this title) prior to repeal of the section by section 1234(b)(1) of Pub.L. 98-525, effective Jan. 1, 1985.

Legislative History. For legislative history and purpose of Pub.L. 98-525, see 1984 U.S. Code Cong. and Adm. News, p. 4174.

APPENDIX D: DEFENSE FEDERAL ACQUISITION REGULATION SUPPLEMENT (DFARS) SUBPART 46.7

46.701 Definitions.

"Acceptance," as used in this subpart and in the warranty clauses at FAR 52.246-17, Warranty of Supplies of a Noncomplex Nature; FAR 52.246-18, Warranty of Supplies of a Complex Nature; FAR 52.246-19, Warranty of Systems and Equipment under Performance Specifications or Design Criteria; and FAR 52.246-20, Warranty of Services; means the execution of an official document (e.g., DD Form 250) by an authorized representative of the Government. The above clauses shall be modified accordingly in DoD contracts.

"Defects," as used in this subpart, means any condition or characteristic in any supplies or services furnished by the contractor under the contract that is not in compliance with the requirements of the contract.

46.702 General.

(d) Planning is an essential step in obtaining an effective warranty. To be effective, warranties should be implemented as an integral part of an overall design, development, test, and production program.

(e) The acquisition cost of a warranty may be included as part of an item's price or may be set forth as a separate contract line item.

(f) Agencies shall establish procedures to track and accumulate data relative to warranty costs.

46.703 Criteria for Use of Warranties.

The use of warranties in the procurement of weapon systems is mandatory pursuant to 10 USC 2403, unless a waiver is authorized. Policy and procedures for obtaining such warranties or waivers are contained in 46.770. Acquisition of warranties in the procurement of supplies that do not meet the definition of a weapon system (e.g., spare, repair, or replenishment parts) is governed by FAR 46.7.

46.704 Authority for Use of Warranties.

In contracts for other than weapon systems, the Chief of the Purchasing Office must approve use of a warranty except for:

- (a) commercial supplies or services (see FAR 46.709);
- (b) technical data, unless the warranty provides for

extended liability (see 46.708);

(c) supplies and services in fixed price type contracts containing quality assurance provisions that reference MIL-I-45208 or MIL-Q-9858; and

(d) supplies and services in construction contracts when the warranties contained in Federal, military or construction guide specifications applicable to a given construction project are used. Authority for use of warranties in the procurement of weapon systems is stated in 46.770.

46.705 Limitations.

(a) Except for contracts for the production of weapon systems under 46.770, contracting officers shall not include warranties in cost-reimbursement contracts, except for those warranties contained in the clauses at FAR 52.246-3, Inspection of Supplies—Cost-Reimbursement; FAR 52.246-8, Inspection of Research and Development—Cost-Reimbursement; and at 52.246-7001, Warranty of Technical Data.

46.706 Warranty Terms and Conditions.

(b)(5) Markings. If items delivered under the contract shall be stamped or marked, it shall be done so in accordance with MIL Standard 129, "Marking for Shipments and Storage" and MIL Standard 130, "Identification Marking of U.S. Military Property." 46.708 Warranties of Technical Data.

A warranty of technical data should be obtained whenever practicable and cost effective. The contracting officer shall consider the factors contained in FAR 46.703 in deciding whether to provide for warranties of technical data and whether there should be an extended liability provision (see 46.770-10). Particular emphasis should be placed on whether the extended liability is justified by (i) the likelihood that correction or replacement of the nonconforming data, or a price adjustment in lieu thereof, will not afford adequate protection to the Government; and (ii) the effectiveness of the additional remedy as a deterrent against furnishing nonconforming data.

46.710 Contract Clauses.

(f) In accordance with 46.708, the contracting officer may insert a clause substantially the same as the clause at 52.246-7001, Warranty of Data, in solicitations and contracts when a fixed-price or cost-reimbursement contract is contemplated that will require data to be furnished. When this clause is not

used, technical data is warranted under the clauses at FAR 52.246-3, Inspection of Supplies—Cost-Reimbursement; FAR 52.246-6, Inspection—Time and Material and Labor Hour; FAR 52.246-8, Inspection of Research and Development—Cost-Reimbursement; and FAR 52.246-19, Warranty of Systems and Equipment Under Performance Specifications or Design Criteria.

(1) If extended liability is desired and a fixed-price incentive contract is contemplated, the contracting officer may use the clause with its Alternate I.

(2) If extended liability is desired and a firm fixed-price contract is contemplated, the contracting officer may use the clause with its Alternate II.

46.770 Use of Warranties in Weapon System Procurements.

This section sets forth policy and procedures for obtaining, pursuant to 10 U.S.C. 2403, certain warranties from prime contractors when contracting for the production of a weapon system.

46.770-1 Definitions.

"At no additional cost to the United States," as used in this section, means at no increase in price for firm fixed price contracts or at no increase in target or ceiling price for fixed price incentive contracts (see also FAR 46.707) or at no increase in estimated cost or fee for cost-reimbursement contracts.

"Design and manufacturing requirements," as used in this section, means structural and engineering plans and manufacturing particulars, including precise measurements, tolerances, materials and finished product tests for the weapon system being produced.

"Essential performance requirements," as used in this section, means the operating capabilities and/or maintenance and reliability characteristics of a weapon system that are determined by the Secretary of Defense (or delegated authority) to be necessary for it to fulfill the military requirement for which the system is designed.

"Initial production quantity," as used in this section, means the number of units of a weapon system contracted for in the first program year of full-scale production.

"Mature full-scale production," as used in this sec-

tion, means follow-on production of a weapon system after manufacture of the lesser of the initial production quantity or one-tenth of the eventual total production quantity.

"Prime contractor," as used in this section, means a party that enters into an agreement directly with the United States to furnish a system or a major subsystem.

"Weapon system," as used in this subpart, means a system or major subsystem used directly by the armed forces to carry out combat missions. By way of illustration, the term "weapon system" includes, but is not limited to the following, if intended for use in carrying out combat missions: tracked and wheeled combat vehicles; self-propelled, towed and fixed guns, howitzers and mortars; helicopters; naval vessels; bomber, fighter, reconnaissance and electronic warfare aircraft; strategic and tactical missiles including launching systems; guided munitions; military surveillance, command, control, and communication systems; military cargo vehicles and aircraft; mines; torpedoes; fire control systems; propulsion systems; electronic warfare systems; and safety and survival systems. This term does not include related support equipment, such as ground-handling equipment, training devices and accessories thereto; or ammunition, unless an effective warranty for the weapon system would require inclusion of such items. This term does not include commercial items sold in substantial quantities to the general public as described at FAR 15.804-3(c).

46.770-2 Policy.

(a) Unless waived under 46.770-9, after 1 January 1985, the Military Departments and Defense Agencies may not enter into a contract for the production of a weapon system with a unit weapon system cost of more than \$100,000 or for which the eventual total procurement cost is in excess of \$10,000,000, unless:

(1) a prime contractor for the weapon system provides the United States with written warranties that—

(i) the weapon systems provided under the contract conform to the design and manufacturing requirements specifically delineated in the contract (or any modification to that contract),

(ii) the weapon systems provided under the contract are free from all defects in materials and workmanship at the time of acceptance or delivery as specified in the contract; and

(iii) the weapon systems, if manufactured in mature full-scale production, conform to the essential performance requirements as specifically delineated in the contract (or any modification to that contract);

(2) the contract terms provide that, in the event the weapon system fails to meet the terms of the above warranties, the contracting officer may—

(i) require the contractor to promptly take such corrective action as necessary (repair, replace and/or redesign) at no additional cost to the United States,

(ii) require the contractor to pay costs reasonably incurred by the United States in taking necessary corrective action, or

(iii) equitably reduce the contract price.

(b) Contracting officers may require warranties that provide greater coverage and remedies than specified above, such as including an essential performance requirements warranty in other than a mature full-scale production contract.

46.770-3 Tailoring Warranty Terms and Conditions.

As the objectives and circumstances vary considerably among weapon system acquisition programs, contracting officers shall appropriately tailor the required warranties on a case-by-case basis, including remedies, exclusions, limitations, and durations; provided, such are consistent with the specific requirements of this section (see also FAR 46.706). The duration specified in any warranty should be clearly related to the contract requirements and allow sufficient time to demonstrate achievement of the requirements after acceptance. Contracting officers may exclude from the terms of the warranty certain defects for specified supplies (exclusions) and may limit the contractor's liability under the terms of the warranty (limitations), as appropriate, if necessary to derive a cost effective warranty in light of the technical risk, contractor financial risk, or other program uncertainties. All subsystems and components will be procured in such a manner so as not to invalidate the weapon system warranty. Contracting officers are encouraged to structure broader and more comprehensive warranties where such are advantageous and in accordance with agency policy. Likewise, the contracting officer may narrow the scope of a warranty where such is appropriate (e.g., where it would be inequitable to require a warranty of all essential performance requirements because a

contractor had not designed the system). It is Department of Defense policy not to include in warranty clauses any terms that cover liability for loss, damage or injury to third parties.

46.770-4 Establishing Essential Performance Requirements.

The Secretary of Defense or heads of military departments, or delegees, shall designate which features of a weapon system are its essential performance requirements. Essential performance requirements may be subsequently modified, superseded or cancelled by the Secretary of Defense or heads of military departments (or delegees) when such is in the interests of the Government.

46.770-5 Warranties on Government-Furnished Property.

A prime contractor shall not be required to provide the warranties specified in 46.770-2 on any property furnished to that contractor by the United States except for (a) defects in installation, (b) installation or modification in such a manner that invalidates a warranty provided by the manufacturer of the property, or (c) modifications made to the property by the prime contractor.

46.770-6 Exemption for Alternate Source Contractor(s).

Agency heads may exempt alternate source contractor(s) from the essential performance warranty requirements of 46.770-2(a)(1)(iii) until that contractor manufactures the first 10% of the eventual total production quantity anticipated to be acquired from that contractor.

46.770-7 Applicability to FMS.

The warranty requirements of 46.770-2 are not mandatory for FMS production contracts. For all weapon systems procured for FMS requirements, the policy of the Department of Defense shall be to obtain the same warranties on conformance to design and manufacturing requirements and against defects in materials and workmanship that are obtained for U.S. supplies. DoD will not normally obtain essential performance warranties for FMS purchasers. However, where the cost for the warranty of essential performance requirements cannot be practically separately identified, the foreign purchaser may be provided the same warranty that is obtained on the same equipment purchased for the U.S. If the

FMS purchaser expressly requests a performance warranty in the Letter of Offer and Acceptance (LOA) the United States will exert its best efforts to obtain the same warranty obtained on U.S. equipment or, if specifically requested by the FMS purchaser, a unique warranty. It is anticipated that the costs for warranties for FMS purchasers may be different from the costs for such warranties for the United States due to such factors as overseas transportation and any tailoring to reflect the unique aspects of the FMS purchaser. Special care must be exercised to ensure that the FMS purchaser shall bear all of the acquisition and administration costs of any warranties obtained.

46.770-8 Cost-Benefit Analysis.

It is Department of Defense policy to only obtain warranties that are cost effective. If a specific warranty is considered not to be cost effective by the contracting officer, a waiver request shall be initiated under 46.770-9. In assessing the cost effectiveness of a proposed warranty, an analysis must be performed which considers both the quantitative and qualitative costs and benefits of the warranty. Costs include the warranty acquisition, administration, enforcement and user costs, weapon system life cycle costs with and without a warranty, and any costs resulting from limitations imposed by the warranty provisions. Costs incurred during development specifically for the purpose of reducing production warranty risks should also be considered. Similarly, the cost-benefit analysis must also consider logistical/operational benefits expected as a result of the warranty as well as the impact of the additional contractor motivation provided by the warranty. Where possible, comparison should be made with the costs of obtaining and enforcing similar warranties on similar systems. The analysis should be documented in the contract file.

46.770-9 Waiver and Notification Procedures.

One or more of the weapon system warranties required by 46.770-2 may be waived if such waiver is in the interests of national defense or if the warranty to be obtained would not be cost effective. Waivers may be granted by the Secretary of Defense, by the Assistant Secretary of Defense (Acquisition and Logistics) for Defense agencies without the power to redelegate, or by the Secretaries of the Army, Navy and Air Force with the power to redelegate to no lower than an Assistant Secretary of the Military Department. Class waivers may be granted where justified. Waivers may be granted provided the

following notifications or reports are made to the Senate and House Committees on Armed Services and on Appropriations:

(a) Major Weapon Systems. With respect to a weapon system that is a major defense acquisition program for the purpose of 10 U.S.C. 139a, before granting a waiver, the waiving official shall notify the aforementioned Committees in writing of an intention to waive one or more of the required warranties. The notice of intent to waive shall include an explanation to the reasons for the waiver and shall include an explanation to the reasons for the waiver and shall ordinarily be given 30 days prior to granting such waiver.

(b) Other Weapon Systems. With respect to weapon systems that are not major defense acquisition programs for the purpose of 10 U.S.C. 139a, waiving officials shall submit an annual report not later than 1 February of each year that lists waivers granted on such programs during the preceding calendar year. This report shall also include an explanation of the reasons for granting each waiver.

(c) Weapon Systems not in Mature Full-Scale Production. Although a waiver is not required, if a production contract for a major weapon system not yet in mature full-scale production will not include a warranty on essential performance requirements, the waiving officials shall nonetheless comply with the notice requirements for major weapon systems.

(d) Processing Waivers, Notifications and Reports. Each Department shall issue procedures for processing waivers, notifications, and reports to Congress. At the minimum, these procedures shall specify:

(1) Requests for waiver shall include—

(i) A brief description of the weapon system and its stage of production, e.g., the number of units delivered and anticipated to be delivered during the life of the program; and

(ii) The specific warranty or warranties required by 46.770-2(a)(1) for which the waiver is requested, the duration of the waiver if it is to go beyond the instant contract, and rationale for the waiver.

(iii) A description of the warranties or other techniques to be employed to assure acceptable field performance of the weapon system.

(2) Notifications and reports shall include—

(i) A brief description of the weapon system and its stage of production, and

(ii) Rationale for not obtaining a warranty.

(3) A written record will be kept of each waiver granted and notification and report made, together with supporting documentation such as a cost-benefit analysis, for use in answering inquiries.

(4) A copy of each notification and report to Congress shall be submitted concurrently to the Assis-

tant Secretary of Defense (Acquisition and Logistics). For Class waivers, this copy shall be submitted in advance of the transmittal to Congress.

46.770-10 Special Contract Clauses.

(a) In accordance with 46.770, the contracting officer shall insert in solicitations and contracts pertaining to the production of weapon systems a clause that describes the contractor's warranties on the weapon system.

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